PART 2 (OF TWO PARTS)

VOLUME 65 *January 1952* NUMBER 1

THE AMERICAN REVIEW

OF

TUBERCULOSIS

OFFICIAL JOURNAL OF AMERICAN TRUDEAU SOCIETY

MEDICAL SECTION OF NATIONAL TUBERCULOSIS ASSOCIATION

TUBERCULOSIS AMONG DIABETICS

The Philadelphia Survey

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Published Monthly at Mount Royal and Guilford Avenues, Baltimore 2, Maryland by the National Tuberculosis Association • Business Off., 1790 Broadway, New York 19, N. Y.

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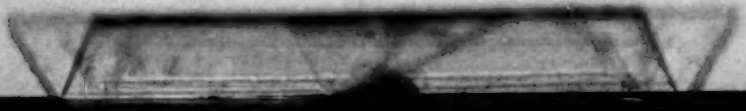
PRINTED IN U. S. A.



TUBERCULOSIS AMONG DIABETICS[1]

The Philadelphia Survey

BY

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[1] The cost of the investigation together with a substantial portion of the cost of publication have been borne by the Philadelphia Tuberculosis and Health Association.

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INTRODUCTION

Although the use of mass chest roentgenographic surveys is well accepted as a tuberculosis case-finding technique, effectiveness varies with the population segments studied. In looking for groups in which the prevalence of tuberculosis might be higher than in schools or industries, the writers decided to investigate the field of diabetes. The literature contains widely varying reports on the prevalence of tuberculosis among diabetics, ranging from 1.0 per cent by Adams (1) to 9.3 per cent by Sossman and Steidl (2). The largest study found was that of Root (3) who obtained roentgenograms on 1,659 consecutive diabetic patients who attended the Joslin Clinic between 1927 and 1930. Because these Deaconess Hospital patients were a homogeneous group, it was thought that a more typical picture might be obtained by a wider spread of source material.

METHODS AND CRITERIA

The project was launched as a cooperative undertaking of the Philadelphia County Medical Society and the Philadelphia Tuberculosis and Health Association with a committee of fourteen experts[2] in charge of the three fields involved: diabetes, tuberculosis, and radiology.

The study was begun in December 1945, and was completed in February 1947. One mobile and one stationary photofluorographic unit were used. The mobile unit was placed in four hospital clinics[3] so that consecutive diabetics were examined roentgenographically on miniature films[4] at their regular clinic visits. The stationary unit was located at the Philadelphia Tuberculosis and Health Association and was used to obtain 14- by 17-inch films.[5] Diabetics were referred to this centrally located unit by private physicians and by the smaller diabetic clinics. It was believed that variation in film size did not constitute a disadvantage (4).

Diabetics and non-diabetics were examined intermittently at both units so that physicians interpreting the films were never aware of whether or not particular films had been taken on diabetics or on non-diabetics.

Survey interpretations were done by Drs. Katharine R. Boucot and David A. Cooper. One "reader" interpreted all films while the second examined those first classified significant plus selections of films interpreted as "negative," both diabetic and non-diabetic. None of the "negative" films was shifted to "positive" by the second interpreter.

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Katharine R. Boucot
W. Edward Chamberlain
A. J. Cohen
David A. Cooper
Edward S. Dillon
Harold L. Israel
Esmond R. Long
Francis D. W. Lukens
Eugene P. Pendergrass
Russell Richardson
Joyce T. Sheridan
E. Roland Snader
Paul Swenson

[3] Unit remained at three clinics for three months each and at one clinic for one month.

[4] 404 35 mm. films, 162 70 mm. films, 2,053 4- by 5-inch films.

[5] 487 14- by 17-inch films.

The United States Public Health Service classification was used in photofluorogram readings: *tuberculosis, suspect tuberculosis, nontuberculous pathology,* and *no significant abnormality.* The term *advanced tuberculosis* is used in referring to moderately advanced and far advanced tuberculosis as well as to tuberculosis under collapse therapy.

Data were recorded on two questionnaires drawn up by the Diabetic Survey Committee (appendix Questionnaires I and II). The patient questionnaire was filled out by volunteer workers from the Emergency Aid of Pennsylvania, trained and supervised by Dr. Russell Richardson. This questionnaire contained queries concerning age, sex, duration of diabetes, heredity, history of pleurisy or tuberculous contact, and such other information as might be better known by the patient than by his physician. The second questionnaire, which contained requests for information regarding the diagnostic blood sugar, five recent blood sugars, frequency of glycosuria, estimate of control, et cetera, was filled out by either the private or clinic physician.

The reliability of the information obtained from the patients may be questioned. With respect to age, sex, and color, the errors were probably negligible. Pleurisy is sufficiently unique in its symptomatology so that the patient's statement was probably reliable. On the other hand, a person's estimate of the age at which he reached maximum weight and the maximum weight itself were undoubtedly subject to serious errors. It seems plausible that these errors were independent of the patient's roentgenographic findings so that a statistical average would have significance. Nevertheless, any conclusions based on this information must be assessed with caution.

Criteria for diagnosis of diabetes: The criteria for the diagnosis of diabetes were those commonly used by workers in this field: a fasting blood sugar of 130 mg. or more per 100 ml. or a blood sugar at any other time of 170 mg. or more per 100 ml., usually with glycosuria. Almost all of these patients had a diagnostic blood sugar of 200 mg. or more per 100 ml. of blood. In the case of a few patients the diagnosis had been made by a glucose tolerance test.

Because diabetes manifested in children and young adults is generally more severe and less stable than that developing in older individuals, it seemed wise to evaluate the effect of age at onset. The term "juvenile diabetic" in this study is used for persons whose onset of diabetes was prior to age Twenty.

Severity of diabetes: The amount of insulin required was used as a gauge of severity of diabetes in this study. Three categories were used: *mild,* those taking no insulin; *moderate,* those taking 1 to 40 units of insulin; *severe,* those taking more than 40 units of insulin.

Estimation of control of diabetes: It is commonly believed that the control of diabetes is an important factor in predisposing the diabetic to tuberculosis (5). Estimation of control requires a whole body of information which it was impossible to collect. It was believed that, while five recent blood sugars were inadequate, they were the only available objective evidence of control. It was recognized that, even using such insufficient data as a gauge, control at the time of the chest survey might be totally unrelated to the tuberculosis seen in

the survey film. Therefore, control of diabetes was gauged in the study on the following scale in relation to the five most recent blood sugars:

Good: None above 200 mg. per 100 ml.
Fair: 1, 2, or 3 above 200 mg. per 100 ml.
Poor: 4 or 5 above 200 mg. per 100 ml.

Weight: Actual and standard weights were compared on a percentage basis, standard weight being considered 95 to 105 per cent of average weight according to height, age, and sex as found in life insurance tables (6).

Exposure to tuberculosis: History of contact with tuberculosis was based on the patient's statement.

COMPOSITION OF GROUP

Three thousand, one hundred and sixty-seven persons were submitted for study as known diabetics. Of these, 3,106 were accepted; 35 were discarded as non-diabetic, and 26 because of insufficient data.

The total number of diabetics in Philadelphia is unknown. The National Health Survey estimate of known diabetics in the United States was 3.67 per thousand population (7). It is believed that this is an underestimate, but Marks states that an increase of 25 per cent is a liberal correction (8). Thus, if Marks' figure of approximately 5 known diabetics per thousand population can be applied to the 1946 Philadelphia population of 2,096,266 (9), the number of known diabetics in Philadelphia can be estimated to be approximately 10,500. This would mean that 30 per cent of Philadelphia's known diabetics were covered in the present study. The findings of Wilkerson and Krall (10) and of diabetes detection campaigns (11) seem to indicate that there are approximately the same number of undiagnosed diabetics as of known cases.

It is possible that the known diabetics represent the more severe diabetics. This possibility should be kept in mind in evaluating the entire study since no attempt at diabetic case finding was associated with the tuberculosis survey.

Source of Material

Of the persons accepted as diabetics, 82.6 per cent were attending twenty-two hospital clinics while 17.4 per cent were patients of ninety-four private physicians. Private physician referrals were disappointing since there were approximately 4,000 practicing private physicians in Philadelphia at the time of the survey.

Age, Race, and Sex

The group was preponderantly older, female, and white. Nearly three quarters of the group were older than fifty. The age distribution was essentially the same as that reported by Spiegelman and Marks in 1946 (12) except that the Philadelphia group contained a few more young diabetics in all race and sex groups. Females contributed approximately 70 per cent, a little more than the percentage given by the National Health Survey (7). Less than thirty years of age, the proportion of the two sexes was about equal. Though 27.7 per cent

of the patients were non-white, this figure was higher than the 14.5 per cent non-white in the 1946 Philadelphia population as a whole (9) (figure 1 and appendix table I).

Duration of Diabetes

Sixty-five per cent of the group had had diabetes less than ten years. Only approximately 2 per cent had the onset of diabetes before insulin was available

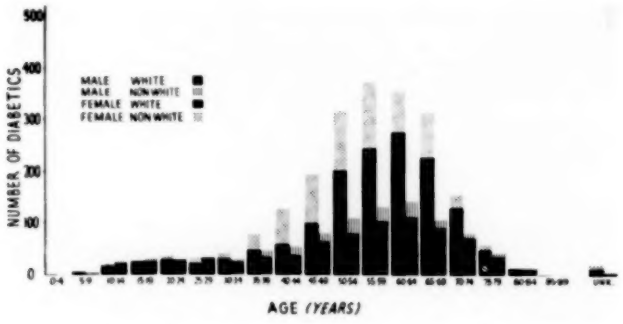

FIG. 1. Composition of group by age, race, and sex

TABLE 1

INSULIN DOSAGE

INSULIN DOSAGE (UNITS)	NUMBER OF DIABETICS	PER CENT DISTRIBUTION
All dosages	3,106	
No insulin	743	24.5
1–40	1,760	58.0
41 and over	532	17.5
Unknown*	71	

* Not included in per cent computation.

(appendix table II). Approximately 7 per cent of the group were less than twenty years of age when diabetes developed.

Severity of Diabetes

Of the 3,035 whose regimens were known, 24.5 per cent were taking no insulin, 58.0 per cent were receiving 40 units or less per day, while only 17.5 per cent were taking more than 40 units per day (table 1 and appendix table III). The younger diabetics, as anticipated, were more severe diabetics. Only 8.9 per cent of the 416 persons younger than forty got along without insulin, while 44.7 per cent took up to 40 units and 46.4 per cent received more than 40 units daily.

In the 2,612 persons older than forty, 26.9 per cent were not taking insulin, 60.2 per cent were taking up to 40 units, and only 12.9 per cent were receiving more than 40 units (table 2 and appendix table IV).

Of the 2,292 persons who knew the type of insulin they were taking, 55.6 per cent were taking protamine zinc insulin; 13.7 per cent, protamine zinc insulin and regular insulin; 17 per cent, globin insulin alone or with regular insulin; and the remaining 13.7 per cent were taking regular insulin alone.

Control of Diabetes

Of the 2,969 persons on whom data regarding control of diabetes were available, 43.1 per cent were under good control; 41.4 per cent, under only fair control; and 15.4 per cent were under poor control.

TABLE 2

INSULIN DOSAGE BY AGE AT SURVEY

INSULIN DOSAGE (UNITS)	ALL AGES		UNDER 40 YEARS		40 YEARS AND OVER		UNKNOWN
	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution	Number
All dosages	3,106		430		2,653		23
No insulin	743	24.5	37	8.9	702	26.9	4
1–40	1,760	58.0	186	44.7	1,572	60.2	2
41 and over	532	17.5	193	46.4	338	12.9	1
Unknown*	71		14		41		16

* Not included in per cent computation.

History of Diabetic Coma

The writers have been unable to find data on the prevalence of coma history among diabetics. The literature yields little information on prevalence of coma among diabetics. Dillon and Dyer (13) state that, among 3,000 diabetics admitted to Philadelphia General Hospital between 1931 and 1936, 8.9 per cent had severe acidosis on admission. A history of previous coma was not included in their study. The prevalence of coma history in the group of the present study was 17 per cent.

The relationship between coma history and age was impressive (appendix table V). Of the persons younger than forty, approximately 40 per cent had a history of having had coma while only 14 per cent of those between forty and sixty years of age and 12 per cent of those older than sixty at the time of the survey had such a history. When age at onset was considered in relation to coma (appendix table VI), there was an increased history of coma the earlier the onset, which is merely another reflection of the fact that diabetes is more severe in the younger diabetic. It must be remembered, however, that coma is much more apt to be fatal when it occurs in older diabetics than in younger persons so that older diabetics who had had a history of coma may not have been

living to be included in the study. Joslin and co-workers (14) give a case mortality from diabetic coma of 2.6 per cent in 305 coma patients younger than 20, while the figure for 346 patients older than 20 was 15.3 per cent. Nevertheless, in the present study, if the percentage of cases with a history of coma in older individuals were increased by 15 per cent to allow for deaths from coma, the prevalence of coma history would still be less than one-half the prevalence in the younger group.

TABLE 3

HISTORY OF COMA BY DURATION OF DIABETES

DURATION OF DIABETES (YEARS)	NUMBER OF DIABETICS	NUMBER DIABETICS WITH HISTORY OF COMA	PER CENT	NUMBER OF DIABETICS HISTORY OF COMA UNKNOWN*
All durations	3,106	516		
Under 5	1,080	115	10.7	10
5–9	881	167	19.1	8
10–14	566	103	18.6	11
15–19	315	66	21.1	2
20–24	128	44	34.6	1
25 and over	58	13	22.4	—
Unknown	78	8		38

* Not included in per cent computation.

TABLE 4

STANDARD WEIGHT DISTRIBUTION BY AGE AT SURVEY

AGE AT SURVEY (YEARS)	NUMBER OF DIABETICS	BELOW STANDARD WEIGHT		AT STANDARD WEIGHT		ABOVE STANDARD WEIGHT		UNKNOWN*
		Number	Per cent	Number	Per cent	Number	Per cent	Number
All ages	3,106	806	26.4	770	25.3	1,472	48.3	58
Under 40	430	161	37.8	134	31.5	131	30.8	4
40 and over	2,653	644	24.6	636	24.3	1,336	51.1	37
Unknown	23	1		—		5		17

* Not included in per cent computation.

In general, the prevalence of coma history in those who had had diabetes five years or longer was twice that in those whose diabetes was of less than five years' duration (table 3).

Standard Weight

The diabetics in the group varied from 65 per cent to 155 per cent of standard. A little less than half were above, and a quarter each were at and below, standard weight.

Of the diabetics older than forty, a little more than half were above standard weight; whereas, of those younger than forty, only 30 per cent were above standard weight (table 4 and appendix table VII).

In a study of 2,275 apparently healthy workers in Philadelphia industry, there was no such trend in regard to weight. Approximately the same percentage was above standard weight in the group younger than age forty as in that older than forty; 34.5 per cent of 1,383 less than forty and 36.2 per cent of 892 more than forty.

Of those whose diabetes had developed before age twenty, approximateiy 40 per cent were below standard weight as contrasted with 24 per cent in those developing diabetes after age twenty.

Approximately 14 per cent had lost more than 50 pounds from their maximal weight; 33 per cent, between 25 and 49 pounds; 43 per cent, between one and 24 pounds; while the remaining 10 per cent gave no history of weight loss. The weight loss may have resulted from the diabetes per se or from the therapy for diabetes.

History of Pleurisy or of Contact with Tuberculosis

Of the 2,918 diabetics who answered the question regarding contact with tuberculosis, 10.2 per cent had had a history of contact.

Of the 2,908 diabetics who answered the question regarding pleurisy, 15.7 per cent had a history of pleurisy.

History of Diabetic Complications

It was believed that additional information regarding the type of diabetic in the study might be given by data on complications. Of those on whom suitable information was available, 3,027 answered the question regarding boils and/or carbuncles; 3,008 answered the question regarding gangrene and/or amputation; 14 per cent gave a history of having had boils and/or carbuncles; and 7 per cent, of gangrene and/or amputation (appendix tables XXIX and XXX).

PREVALENCE OF TUBERCULOSIS

Prevalence of tuberculosis refers to tuberculosis in the total survey. It should be noted, however, that chest roentgenographic surveys are screening processes and are not diagnostic. Tuberculosis interpreted by survey as "probably active" is designated as "active" tuberculosis. The writers are well aware of the difficulties inherent in attempting to evaluate the *activity* of tuberculosis on a single film. Yet the problems are similar, if of greater magnitude, to those encountered in interpreting the abnormalities on a single film as tuberculosis. Nevertheless, it is believed that the recording of an impression of activity has some value (15, 16).

The fibrocalcific lesions interpreted as "probably inactive" tuberculosis may well be irrelevant to consideration of the relationship between diabetes and tuberculosis in that they may represent tuberculosis which was stabilized before the onset of diabetes. For this reason, it is believed that the tabulations based on "active" tuberculosis may be more pertinent.

The prevalence of tuberculosis was 8.4 per cent in the 3,106 diabetics. No suitable control group could be agreed upon. However, a group of 71,767 apparently healthy Philadelphia industrial workers surveyed between October 1942

and May 1945 was adjusted to a composition comparable in age, race, and sex to the diabetics (appendix table VIII). The prevalence of tuberculosis thus obtained was 4.3 per cent, one-half the figure noted in the diabetic group. The difference is statistically significant.

The prevalence of active tuberculosis was 2.6 per cent. Thirty-six of the 80 cases classified as active were previously known. The percentage of survey tuberculosis was almost identical for both clinic and private patients even when active tuberculosis only was considered.

Of the 261 films interpreted as tuberculosis, 51 were in cases which were known prior to the survey, leaving 210 cases discovered by the survey, or a prevalence of 6.8 per cent exclusive of cases previously known to be tuberculosis.

It was believed that the inclusion of known cases might possibly introduce a bias because of differences between these cases and those previously unknown. Of the 51 previously known cases, 36, or 70.6 per cent, were active as compared with only 21.0 per cent active among the 210 previously unknown cases. This is not too surprising since one would expect a much higher percentage of the active cases to come to the attention of the physician.

In respect to age, race, and sex distribution, however, the previously known cases were comparable to the others. Clearly a representative sample of diabetics will contain a certain fraction of already known tuberculous cases, and a definitely unfavorable bias would be introduced by eliminating all such cases. It is believed that 20 per cent previously known is probably not too far wrong and that the error in computing the prevalence of tuberculosis among diabetics by use of these cases is small. In any event, the prevalence of 6.8 per cent in those never before known to have had tuberculosis is still significantly higher than the figure quoted above for non-diabetics.

Age, Race, and Sex

There are essentially two ways of examining the relationship of tuberculosis prevalence to age: (*1*) as a function of the age when examined and (*2*) as a function of the age at onset of diabetes. The difference represents the duration of diabetes.

Prevalence of survey tuberculosis in the total population is known to vary decidedly with age. For purposes of comparison, then, the prevalence given by age at examination seems appropriate. On the other hand, it is also known that diabetes in younger persons is generally much more severe than in older persons, and the susceptibility to tuberculosis may be much more pronounced among those with early onset of diabetes. According to Root (17) the prevalence of tuberculosis in high-school-age diabetics is approximately twelve times that for non-diabetics. Thus, there are arguments in favor of both age at examination and age at onset, so both will be used in the subsequent discussion.

Figure 2 and appendix table IX present the prevalence of total survey tuberculosis by age at examination, race, and sex in the diabetic group and in the industrial group. The number of Negro diabetics was too small to yield a clear picture. However, among the white diabetics there was an increasing prevalence

of tuberculosis with increasing age except for a fall in the middle-age range among the males.

In searching for an explanation for the decreased prevalence in the middle-aged white males, it seemed possible that tuberculosis mortality was involved. Clearly, a large number of deaths from tuberculosis in a particular age group would lower the prevalence of tuberculosis in that age group. It is known that tuberculosis mortality in non-diabetics is highest in young females and young non-white males. Possibly, where diabetes is a factor, this effect is enhanced and may increase mortality in the young, white male.

Root (3) gives 2.8 per cent as the tuberculosis prevalence among 1,659 consecutive adult diabetics examined roentgenographically at the New England

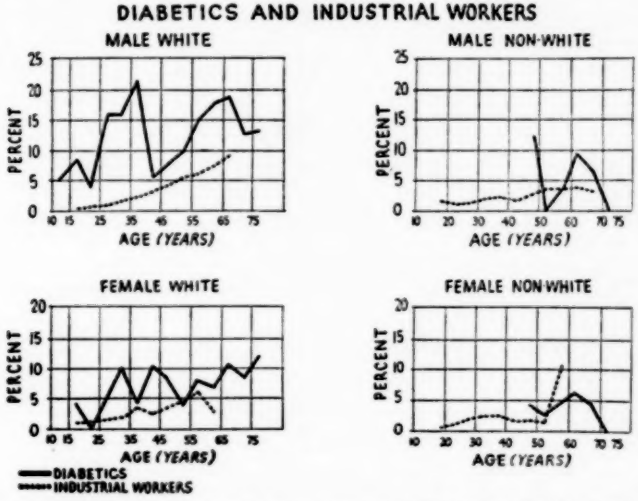

FIG. 2. Prevalence of tuberculosis by age, race, and sex. Comparison between diabetics and industrial workers.

Deaconess Hospital. There is no statement regarding the age distribution of these diabetics.

When active disease only was studied the situation was quite different (figure 3 and appendix table X). There was considerably more active tuberculosis in those younger than forty than in the older diabetics, 5.3 per cent as contrasted with 1.7 per cent. Of the 69 patients with active tuberculosis whose age was known, one-third were younger than forty. This is in contrast with the findings of Wiener and Kavee (18) who reported that only 18.8 per cent of 218 tuberculous diabetics were younger than forty.

The prevalence of tuberculosis among white diabetics was almost 10 per cent as contrasted with less than half that figure, 4.3 per cent, in Negro diabetics.

Other Philadelphia surveys have revealed a slightly higher prevalence of tuberculosis in whites than in Negroes, 2.4 per cent in whites as compared with 1.9 per cent in Negroes in the report by Elkin and co-workers (19), and, in the same group adjusted to the diabetic study for age, race, and sex, 4.9 per cent in whites, 2.8 per cent in Negroes, approximately the same ratio as in the diabetics. The Harlem study (20) also revealed a higher prevalence of survey tuberculosis in whites than in Negroes. However, the 1946 tuberculosis mortality rate for Philadelphia whites was 33.9 per 100,000, less than one-fifth the figure of 182.9 for the Negro population. It is conceivable that, as pointed out by

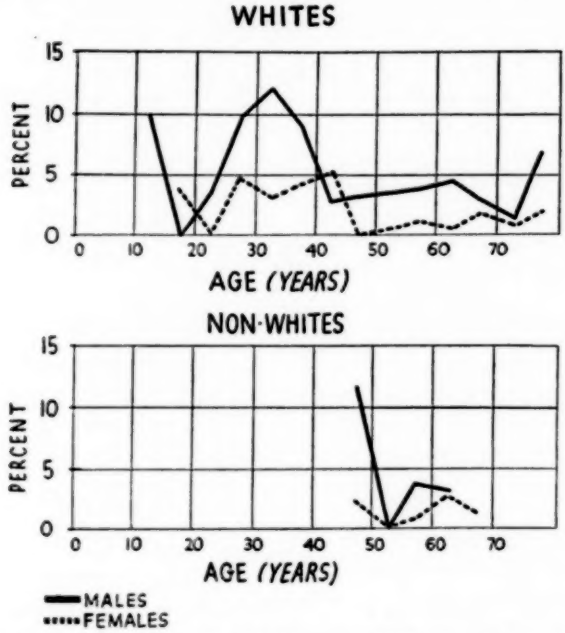

FIG. 3. Prevalence of active tuberculosis among diabetics by age, race, and sex

Teague (21), the more acute and symptomatic course of tuberculosis in the Negro, with its higher case fatality rate, accounts for the fact that survey prevalence of tuberculosis is actually less in Negroes than in whites. When active tuberculosis alone was considered in the diabetic study (appendix table X) racial differences were not so marked.

It may be conjectured that the seriousness of tuberculosis in the Negro is enhanced by the presence of diabetes so that the mortality rate among tuberculous Negro diabetics may be even higher than that among tuberculous Negroes without diabetes. No data on this subject are available, but Joslin and co-

workers (22) state that, in 1940, death rates from diabetes among Negroes less than fifty-five years of age were actually higher than those among whites.

Almost twice as much tuberculosis was found in male diabetics (12.3 per cent) as in female diabetics (6.7 per cent). This reflected the presence of the segment of white diabetics. Non-white males and females both had a prevalence of 4.3 per cent. The increased prevalence in white males was most striking in persons younger than forty, among whom the figures were 12 per cent for males and 4 per cent for females. Approximately twice as much tuberculosis was found in white males older than forty than in white females in that age group. These general relationships held true even when active tuberculosis only was considered.

In the adjusted industrial group (appendix table VIII) the prevalence of tuberculosis among males was 5.3 per cent, whereas it was 3.9 per cent among females. In Kurzrock's and Anderson's study (23) of Harlem relief recipients, white males had an 11.5 per cent prevalence while the figure for white females was 5.4 per cent.

TABLE 5

PREVALENCE OF TUBERCULOSIS BY DURATION AND AGE AT SURVEY

DURATION OF DIABETES (YEARS)	ALL AGES			UNDER 40 YEARS			40 YEARS AND OVER			UNKNOWN	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All durations	3,106	261	8.4	430	33	7.7	2,653	217	8.2	23	11
Under 10	1,961	147	7.5	309	14	4.5	1,646	131	8.0	6	2
10 and over	1,067	94	8.8	114	19	16.7	953	75	7.9	—	—
Unknown	78	20		7	—		54	11		17	9

Duration of Diabetes

If diabetes is a factor predisposing to tuberculosis, it would be anticipated that an increasing prevalence of tuberculosis would be observed with increasing duration of diabetes. This was not the case in the present series except in younger persons (table 5). At the time of the survey, the tuberculosis prevalence in persons younger than forty was 5 per cent in those with diabetes of less than ten years' duration, while it was 17 per cent in those whose diabetes had been known for more than ten years. This striking disparity was absent in those older than forty in whom a prevalence of tuberculosis of 8 per cent was found irrespective of duration of the diabetes.

When active tuberculosis alone was considered, the differences between younger and older diabetics were more marked (table 6). Persons younger than forty whose diabetes was of less than ten years' duration had only 3.2 per cent active tuberculosis in comparison with 11.4 per cent in those whose diabetes was of more than ten years' duration. In contrast, persons older than forty with diabetes of less than ten years' duration had approximately 2 per cent active

tuberculosis, while those whose diabetes was of longer than ten years' duration had a prevalence of slightly more than 1 per cent.

It was suspected that the difference in the younger groups might be attributable to the more severe type of diabetes seen in juvenile diabetics. Therefore, the group was examined in relation to age at onset of diabetes (appendix tables XI and XII). The results were almost identical with those based on age at time of survey.

Increased duration of diabetes seemed to be related to increased tuberculosis prevalence in those diabetics who had a history of coma, but this may reflect the seriousness of juvenile diabetes rather than of coma per se (appendix table XVII).

If mortality from tuberculosis in association with diabetes is higher than that from tuberculosis in non-diabetics, the explanation of the lack of correlation between prevalence of tuberculosis and duration of diabetes in those older than forty may be the death of diabetics with active tuberculosis before their diabetes is of long duration. Certainly, in view of the higher tuberculosis mortality in past years, the older diabetics were subjected to greater risk of contact with infectious tuberculosis than were the younger diabetics.

TABLE 6

PREVALENCE OF ACTIVE TUBERCULOSIS BY DURATION AND AGE AT SURVEY

DURATION OF DIABETES (YEARS)	ALL AGES			UNDER 40 YEARS			40 YEARS AND OVER			UNKNOWN	
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All durations	3,106	80	2.6	430	23	5.3	2,653	46	1.7	23	11
Under 10	1,961	44	2.2	309	10	3.2	1,646	32	1.9	6	2
10 and over	1,067	24	2.2	114	13	11.4	953	11	1.2	—	—
Unknown	78	12		7	—		54	3		17	9

Severity of Diabetes

If diabetes predisposes to tuberculosis, then, presumably, the more severe the diabetes, the higher the tuberculosis prevalence. It is difficult to evaluate severity of diabetes but, according to Lukens and Dohan (24), the amount of insulin required is the best single clinical indication of the severity of diabetes; hence, insulin dosage was used as a gauge in this study (table 7).

It was somewhat surprising to note a higher prevalence of tuberculosis, 9.2 per cent, in the 743 who were taking no insulin than in any other group. This was due largely to the diabetics older than forty. Several other factors may be involved. Among these may be the crudeness of the measure of diabetic severity by insulin dosage, the possibility that severity at a previous period rather than at the time of the survey was important, inadequate control of diabetes, an increased tuberculosis mortality in severe diabetics, and the fact that some of

the stable tuberculous infections may have occurred prior to the onset of diabetes so that the diabetes and tuberculosis had no significant relationship. In the diabetics younger than forty, a clear relationship existed between severity of diabetes and prevalence of tuberculosis; 3 per cent of those taking less than 40 units of insulin had tuberculosis as contrasted with 12 per cent of those taking more than 40 units. The situation was similar when age at onset was substituted for age at the time of the survey (appendix table XIII).

When active tuberculosis only was considered, the situation was more similar to what had been anticipated. There was three times as much active tuberculosis

TABLE 7

PREVALENCE OF TUBERCULOSIS BY INSULIN DOSAGE AND AGE AT SURVEY

INSULIN DOSAGE (UNITS)	ALL AGES			UNDER 40 YEARS			40 YEARS AND OVER			UNKNOWN	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All dosages	3,106	261	8.4	430	33	7.7	2,653	217	8.2	23	11
No insulin	743	68	9.2	37	2	5.4	702	65	9.3	4	1
1–40	1,760	131	7.4	186	6	3.2	1,572	124	7.9	2	1
41 and over	532	46	8.6	193	24	12.4	338	22	6.5	1	—
Unknown	71	16		14	1		41	6		16	9

TABLE 8

PREVALENCE OF ACTIVE TUBERCULOSIS BY INSULIN DOSAGE AND AGE AT SURVEY

INSULIN DOSAGE (UNITS)	ALL AGES			UNDER 40 YEARS			40 YEARS AND OVER			UNKNOWN	
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All dosages	3,106	80	2.6	430	23	5.3	2,653	46	1.7	23	11
No insulin	743	10	1.3	37	1	2.7	702	8	1.1	4	1
1–40	1,760	30	1.7	186	5	2.7	1,572	24	1.5	2	1
41 and over	532	28	5.3	193	17	8.8	338	11	3.3	1	—
Unknown	71	12		14	—		41	3		16	9

(table 8) in the severe diabetics as in the mild ones. The relationship between severity and prevalence of tuberculosis was more marked in the younger group. The same held true when age at onset was considered (appendix table XIV).

Wiener and Kavee (25), in a study of 218 tuberculous diabetics who were preponderantly more than forty years of age, noted no relationship between the severity of the diabetes and the type of tuberculosis. These investigators called attention to the fact that, among the mildest cases of diabetes, they would often find widespread pulmonary tuberculosis running a rapidly progressive and fatal course, while in some of the severest diabetics the tuberculosis assumed a milder, slowly progressive course.

Control of Diabetes

It was anticipated that control of diabetes would be a very important factor in relation to tuberculosis prevalence. However, among the persons with preponderantly high blood sugar concentrations, the tuberculosis prevalence was only 6 per cent while in the remainder of the group it was 9 per cent. It was believed that those with low values for blood sugar might represent the more severe diabetics on larger doses of insulin, so severity of diabetes was studied as a factor (appendix table XV). A similar trend toward decreased prevalence with more marked hyperglycemia was noted except in the group taking no insulin. In persons taking more than 40 units of insulin, more than twice as much tuberculosis was found in those with no blood sugar values above 200 mg. per 100 ml. than in those with consistently marked hyperglycemia.

When active tuberculosis alone was considered, the situation was similar (appendix table XVI) except for the group taking no insulin, in which almost twice as much active tuberculosis was present with marked hyperglycemia as with mild hyperglycemia. This seemed to confirm the impression that consistently normal values for blood sugar in the persons on insulin may have been obtained as a consequence of an effort to control severe diabetes by large doses of insulin. Another explanation may be the death prior to the survey of the poorly controlled diabetics who had developed tuberculosis. On the other hand, it is possible that control of diabetes at the time of the survey was unrelated to the prevalence of tuberculosis. The criteria for control used were admittedly inadequate since no one laboratory test reflects the multiphasic diabetic deviations from normal or the characteristic fluctuations in response to exercise, stress, and other variables.

History of Diabetic Coma

Another approach to the problem of diabetic control is through a study of coma, which, according to Root and Marble (26) "is the end result of the disease when uncontrolled."

When the group as a whole was considered, there was no significant difference between those with and those without a history of coma. However, there was a higher prevalence of tuberculosis in those younger than forty (at the time the roentgenogram was obtained) who had had coma, 9.6 per cent, than in those at the same age who never had had coma, 5.8 per cent (table 9). When age at onset was considered, this increased prevalence with history of coma was also noted in those with a diabetic onset before the age of twenty, while the older age group showed no such trend.

When active tuberculosis only was considered, there was less difference between those with and without coma history in all age groups. Approximately the same prevalence of active tuberculosis was noted in those younger than forty, whether or not they had had coma, 6.0 per cent with coma and 4.7 per cent without. Moreover, while these figures were much higher than those for the persons older than forty, the prevalence of active tuberculosis among the latter was the same regardless of coma, 1.4 per cent with coma and 1.6 per cent without (table

10). The situation was similar when age at onset was used instead of age at the time of the survey.

These findings seem to be at variance with commonly held concepts. Root and Bloor (27) found that, among patients who had had diabetic coma, 17.8 per cent developed pulmonary tuberculosis within five years after recovery from coma. Dr. Joslin suggested a re-examination of the cases in the present study with duration of diabetes in mind (appendix tables XVII and XVIII). Although at first glance it appeared that duration was an important factor in those with coma, a breakdown by age showed that this effect was primarily due to the greater prevalence of coma history in younger persons. As noted previously,

TABLE 9

PREVALENCE OF TUBERCULOSIS BY HISTORY OF COMA AND AGE AT SURVEY

HISTORY OF COMA	ALL AGES			UNDER 40 YEARS			40 YEARS AND OVER			UNKNOWN	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All groups	3,106	261	8.4	430	33	7.7	2,653	217	8.2	23	11
Coma	516	41	7.9	167	16	9.6	346	24	6.9	3	1
No coma	2,520	206	8.2	257	15	5.8	2,254	185	8.2	9	6
Unknown	70	14		6	2		53	8		11	4

TABLE 10

PREVALENCE OF ACTIVE TUBERCULOSIS BY HISTORY OF COMA AND AGE AT SURVEY

HISTORY OF COMA	ALL AGES			UNDER 40 YEARS			40 YEARS AND OVER			UNKNOWN	
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All groups	3,106	80	2.6	430	23	5.3	2,653	46	1.7	23	11
Coma	516	16	3.1	167	10	6.0	346	5	1.4	3	1
No coma	2,520	55	2.2	257	12	4.7	2,254	37	1.6	9	6
Unknown	70	9		6	1		53	4		11	4

those less than forty years of age had an increased prevalence of tuberculosis with increased duration of diabetes (appendix table XVII). This was independent of coma history.

While none of the 495 coma cases in Joslin's 1923–1946 series (28) died of tuberculosis while hospitalized for coma, of the 434 who survived, 15 (3.5 per cent) died of tuberculosis following hospital discharge. It would be of interest to know the figure for those who never had coma.

Bertram (29) states that 80 per cent of his asthenic diabetics developed tuberculosis after having had coma. The group in the present study was examined from this point of view, but nothing of significance in relation to coma was found.

Standard Weight

The association between obesity and diabetes has long been recognized, as has the association of thinness and tuberculosis which resulted in the terms "consumption" and "phthisis." It seemed, therefore, that it would be of interest to study the relationship between standard weight and prevalence of tuberculosis in the diabetic.

Table 11 revealed the striking fact that the prevalence of tuberculosis in those *below* standard weight was more than twice that in those above standard weight. The question whether this is cause or effect cannot be answered. Even when active tuberculosis only was studied, the same relationship was noted

TABLE 11

PREVALENCE OF TUBERCULOSIS BY AGE AT SURVEY AND STANDARD WEIGHT

STANDARD WEIGHT	ALL AGES			UNDER 40 YEARS			40 YEARS AND OVER			UNKNOWN	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All groups	3,106	261	8.4	430	33	7.7	2,653	217	8.2	23	11
Below standard weight	806	96	11.9	161	12	7.5	644	83	12.9	1	1
At standard weight	770	72	9.4	134	14	10.4	636	58	9.1	—	—
Above standard weight	1,472	78	5.3	131	6	4.6	1,336	71	5.4	5	1
Unknown standard weight	58	15		4	1		37	5		17	9

TABLE 12

PREVALENCE OF ACTIVE TUBERCULOSIS BY AGE AT SURVEY AND STANDARD WEIGHT

STANDARD WEIGHT	ALL AGES			UNDER 40 YEARS			40 YEARS AND OVER			UNKNOWN	
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All groups	3,106	80	2.6	430	23	5.3	2,653	46	1.7	23	11
Below standard weight	806	36	4.5	161	10	6.2	644	25	3.9	1	1
At standard weight	770	18	2.3	134	9	6.7	636	9	1.4	—	—
Above standard weight	1,472	14	1.0	131	4	3.1	1,336	9	0.7	5	1
Unknown standard weight	58	12		4	—		37	3		17	9

(table 12). Weights and measurements were obtained on 2,275 non-diabetics working in industry and it was found that, while there was less tuberculosis than among the diabetics, there was also twice as much tuberculosis in those below standard weight as in those over standard weight (appendix table XIX).

Because of the therapeutic emphasis placed on thinness in the treatment of diabetes, the situation was examined from several angles. Age was studied in relation to standard weight and prevalence of tuberculosis. Knowing that young diabetics are less likely to be obese and that the diabetes tends to be severe, it was thought possible that the youth of the thin diabetics might be a factor. Table 11 revealed the fact that, while there was more tuberculosis in older

diabetics than in younger persons, there was still approximately twice as much tuberculosis in those below standard weight in all age groups as in those above standard weight. When active tuberculosis only was considered, the situation was similar despite the fact that the prevalence of active tuberculosis was considerably less in the older group (table 12).

Next, the effect of severity of diabetes relative to standard weight was studied (appendix table XX). Of the diabetics who did not require insulin, those below standard weight had the high total prevalence of 16 per cent, and this figure was three times that for those above standard weight. In those taking insulin there was also a marked but not so dramatic increase in the prevalence of tuberculosis in the group below standard weight. A similar situation in regard to standard weight holds for active tuberculosis in that those below standard weight in all categories had more tuberculosis than those above standard weight (appendix table XXI). However, the effect of increasing severity of the diabetes was quite marked in the active cases of tuberculosis.

These considerations suggested that control of the diabetes might be important. As pointed out under the discussion of control of diabetes in relation to prevalence of tuberculosis, however, no data on control over a long period of time are available, so that, except for the casual impression of the clinician, no measure of control was at hand. Appendix tables XXII and XXIII reveal the fact that the relationship between standard weight and prevalence of tuberculosis held in all three control categories.

It was difficult to evaluate the relative importance of severity and underweight in younger diabetics, while underweight seemed more important in older diabetics (appendix tables XXIV and XXV). Perhaps, just as older diabetics may do better from a cardiovascular viewpoint if the blood sugar is allowed to remain slightly above normal, so, from the viewpoint of the phthisiologist, diabetics may develop less tuberculosis if they are allowed to be just above standard weight (30).

History of Contact with Tuberculosis

Tuberculosis is an infectious disease, and history of contact means known repeated contact rather than the casual unknown contact implicit in the presence of tuberculosis without knowledge of exposure. Therefore, it was to be expected that a higher prevalence of tuberculosis would be found in diabetics with a history of contact. Twelve per cent of those with a history of contact had tuberculosis, while 7 per cent in the group without known exposure had tuberculosis. This effect was much more marked in those below standard weight (appendix table XXVI). It suggests that diabetics with a history of contact who are below standard weight should be examined roentgenographically every six months instead of once a year, since the tuberculosis prevalence of more than 18 per cent was the highest figure for tuberculosis obtained in this study and represented three times the figure for the prevalence of tuberculosis in contacts above standard weight. To be sure, it is possible that the diabetics below standard weight with a history of contact were thin because of their tuberculosis.

A similar situation was found when active tuberculosis only was considered (appendix table XXVII).

History of Pleurisy

It is a well-known medical adage that it is wise to consider pleural effusions tuberculous until proved otherwise. In this large group of diabetics it was not possible to establish the fact that a given percentage actually had had pleural effusions. In the absence of roentgenograms for review, it was thought unwise to rely on questioning the patient in regard to aspiration. Instead, a question in regard to chest pain which was worse on deep breathing seemed to be readily understood and simply answered. It is recognized that not all pleuritic pain is due to tuberculosis, but the data analyzed seemed of interest.

It was found that the 457 who gave a history of pleurisy had slightly more tuberculosis than those with no such history (appendix table XXVIII). Twice as much active tuberculosis was noted among those with a history of pleurisy as in those without such a history. No data on non-diabetics are available for comparison.

History of Diabetic Complications

It had been anticipated that diabetics with diabetic complications might have more tuberculosis than those who had not had such complications. Appendix tables XXIX and XXX reveal no marked difference in the prevalence of tuberculosis in diabetics with histories of gangrene and/or amputations or diabetics with histories of boils and/or carbuncles than in the diabetics without such histories. This merely means that the increased prevalence of cardiovascular disorders and the increased susceptibility to pyogenic infections of the diabetic have no obvious relation to the increased susceptibility to tuberculosis.

Root (31) says "carbuncles, like coma and gangrene, are more apt to appear in the fat than in the thin diabetic." This may be a factor in the lack of correlation between tuberculosis and these complications.

TUBERCULOSIS IN THE DIABETIC

The clinical diagnosis of early tuberculosis in the diabetic presents certain inherent difficulties because of the similarities between the symptoms of mildly uncontrolled diabetes and early active tuberculosis. However, the interpretation of a chest roentgenogram is not subject to such difficulties.

Therefore, it seems justifiable to compare the results of the diabetic survey with the results of other surveys. An attempt was made to obtain a group of non-diabetic clinic patients whose photofluorograms had been interpreted as tuberculous during the same general period of time as the diabetic survey and who were similar in age, race, and sex to the tuberculous diabetics. The sample was obtained by matching age in ten-year blocks, race, and sex. Tuberculous persons were chosen consecutively as they appeared in the chronological list until the requirements in each category were fulfilled. Because of the large number of diabetic women older than sixty, it was necessary to turn to surveys

other than those conducted on hospital outpatients. No attempt was made to match the 11 of unknown age. Of the 250 in the comparison group, 135 were taken from hospital surveys, 113 from community surveys, and 2 from industrial surveys, in that order. It should be pointed out that the surveys from which the comparison group was drawn were routine surveys. They were not set up with any idea that ultimately their significant cases would serve in this manner. In two instances it was not possible to match precisely according to age. A male non-white, seventeen years old, was substituted for a male non-white in the zero- to nine-year age group. A female non-white, seventy-five years old, was substituted for one in the sixty- to sixty-nine year age group. It must be recognized that such a selection for purposes of comparison is distinctly artificial.

The data examined in the diabetic and the comparison groups were as follows: extent of disease, site of lesions, and presence of unequivocal cavitation. An impression of activity based on an estimate of pathologic type of lesion was also studied despite the fact that, as noted previously, the writers realize the difficulties inherent in such impressions. Nevertheless, it was believed that errors would be of the same order in diabetics and in the comparison group.

Obviously, interpretations based on single survey films are open to the same criticisms as those based on any single roentgenogram.

Extent of Disease

It is well known that in sanatoriums the tuberculous infections are preponderantly advanced in stage, while survey tuberculosis is largely minimal. Banyai and Cadden (32), in a study of 125 tuberculous diabetics admitted to Muirdale Sanatorium over a ten-year period, found only 2.4 per cent in whom the lesions were minimal in extent. Of the 261 diabetics interpreted as tuberculous in the present study, the lesions of 63 per cent were minimal (table 13). In the comparison group, 74 per cent of the lesions were minimal (table 14), approximately the same proportion as that found by Elkin and co-workers (70 per cent) (19) and by Boucot and Sokoloff (76 per cent) (33).

Though the percentage of minimal tuberculosis was not very different among the diabetics and those in the comparison group, there was a significantly increased proportion of active disease in the diabetics regardless of the stage of tuberculosis.

Not a single one of the non-diabetics in the comparison group had a pleural effusion, while there were 3 pleural effusions and one tuberculous pericarditis among the diabetics. Two of these diabetics were white and two non-white. There was one person with active primary tuberculosis in the comparison group, a non-white; whereas there were 3 in the diabetic group, 2 whites and one non-white (tables 13 and 14).

Site of Lesions

There is a clinical impression that tuberculosis in the diabetic is characterized by mid-lung and basal lesions. The present writers have never analyzed their usual surveys with reference to site of disease but have attempted to study the

tuberculous lesions in the diabetics and in the matched sample from this standpoint. All involved lung thirds were listed for each of the 248 diabetics and the 246 persons in the comparison group who had visible parenchymal lesions. Appendix tables XXXI and XXXII present the percentage of cases with

TABLE 13

DISTRIBUTION OF STAGE OF TUBERCULOSIS BY RACE AND ACTIVITY IN TUBERCULOUS DIABETICS

Total Tuberculosis

STAGE	ALL RACES		WHITE		NON-WHITE	
	TB	Per cent distribution	TB	Per cent distribution	TB	Per cent distribution
All stages	261	100.	224	100.	37	100.
Minimal	165	63.2	144	64.3	21	56.8
Advanced*	85	32.6	74	33.0	11	29.7
Pleural and pericarditis	8	3.1	4	1.8	4	10.8
Active primary	3	1.1	2	0.9	1	2.7

Active Tuberculosis

STAGE	ALL RACES		WHITE		NON-WHITE	
	Active	Per cent distribution	Active	Per cent distribution	Active	Per cent distribution
All stages	80	100.	64	100.	16	100.
Minimal	15	18.8	12	18.8	3	18.8
Advanced*	58	72.5	48	75.0	10	62.5
Pleural and pericarditis	4	5.0	2	3.1	2	12.5
Active primary	3	3.8	2	3.1	1	6.2

Other than Active Tuberculosis

STAGE	ALL RACES		WHITE		NON-WHITE	
	TB	Per cent distribution	TB	Per cent distribution	TB	Per cent distribution
All stages	181	100.	160	100.	21	100.
Minimal	150	82.9	132	82.5	18	85.7
Advanced*	27	14.9	26	16.3	1	4.8
Pleural and pericarditis	4	2.2	2	1.3	2	9.5
Active primary	—	—	—	—	—	—

* Includes pneumothorax, thoracoplasty, and post-lobectomy cases.

involvement in each lung third. While the white diabetics had somewhat more tuberculosis in the mid-lung zones than did the whites in the comparison group, it was believed that this analysis obscured the true picture because of dissemination.

Since serial films were not available, an attempt was made to gauge the site of origin by excluding all cases with involvement of more than one lung third. Tables 15 and 16 and appendix tables XXXIII and XXXIV reveal an increase

TABLE 14

DISTRIBUTION OF STAGE OF TUBERCULOSIS BY RACE AND ACTIVITY IN COMPARISON GROUP

Total Tuberculosis

STAGE	ALL RACES		WHITE		NON-WHITE	
	TB	Per cent distribution	TB	Per cent distribution	TB	Per cent distribution
All stages	250	100.	213	100.	37	100.
Minimal	184	73.6	157	73.7	27	73.0
Advanced	59	23.6	50	23.5	9	24.3
Pleural	3	1.2	3	1.4	—	—
Active primary	1	0.4	—	—	1	2.7
Hematogenous and silicotuberculosis*	3	1.2	3	1.4	—	—

Active Tuberculosis

STAGE	ALL RACES		WHITE		NON-WHITE	
	Active	Per cent distribution	Active	Per cent distribution	Active	Per cent distribution
All stages	28	100.	22	100.	6	100.
Minimal	6	21.4	6	27.3	—	—
Advanced	21	75.0	16	72.7	5	83.3
Pleural	—	—	—	—	—	—
Active primary	1	3.6	—	—	1	16.7
Hematogenous and silicotuberculosis*	—	—	—	—	—	—

Other than Active Tuberculosis

STAGE	ALL RACES		WHITE		NON-WHITE	
	TB	Per cent distribution	TB	Per cent distribution	TB	Per cent distribution
All stages	222	100.	191	100.	31	100.
Minimal	178	80.2	151	79.1	27	87.1
Advanced	38	17.1	34	17.8	4	12.9
Pleural	3	1.4	3	1.6	—	—
Active primary	—	—	—	—	—	—
Hematogenous and silicotuberculosis*	3	1.4	3	1.6	—	—

* Includes 2 hematogenous and 1 case of silicotuberculosis.

in basal tuberculosis among the diabetics relative to those in the comparison group. This increase, however, can be explained by the higher proportion of diabetics with active tuberculosis since there was no appreciable difference

between the diabetics and the comparison group when "active" and "other than active" were considered separately. Approximately one-half of the active tuberculosis in both groups was in the lower two-thirds. This seemed surprising for the comparison group since it is not in accord with common clinical concepts. Both groups in this study, however, consist of predominantly older individuals. It is conceivable that active tuberculosis in older individuals tends toward a higher proportion of basal involvement and that the clinical impression of increased basal tuberculosis among diabetics may be due to their older age.

In those cases where only one lung was involved, tuberculosis was present in the right lung more often than in the left lung both among the diabetics and

TABLE 15

SITE OF PATHOLOGY BY ACTIVITY IN TUBERCULOUS DIABETICS

(Limited to Cases with Involvement of Only One Lung Third)

THIRDS	ALL CASES		ACTIVE		OTHER THAN ACTIVE	
	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution
All sites	130	100.	27	100.	103	100.
Upper third	98	75.4	12	44.4	86	83.5
Middle or lower third	32	24.6	15	55.6	17	16.5

TABLE 16

SITE OF PATHOLOGY BY ACTIVITY IN COMPARISON GROUP

(Limited to Cases with Involvement of Only One Lung Third)

THIRDS	ALL CASES		ACTIVE		OTHER THAN ACTIVE	
	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution
All sites	126	100.	8	100.	118	100.
Upper third	109	86.5	4	50.0	105	89.0
Middle or lower third	17	13.5	4	50.0	13	11.0

among those in the comparison group. There was a higher percentage of bilateral involvement among those in the comparison group than among the diabetics. This somewhat unexpected finding remains unexplained. It may be due to a more acute course of tuberculosis in the diabetic. These differences were still apparent when viewed according to impression of activity (appendix tables XXXV and XXXVI).

Impression of Activity

While it is often impossible to evaluate the activity of tuberculosis on the basis of a single film, as noted earlier (page 7), the presence of definite cavitation or extensive soft mottling can somewhat justifiably be interpreted as

"probably active." The writers have attempted to be exceedingly conservative in arriving at the designation. The following cases are illustrative:

Case 1. F. G., a 22-year-old Negress, was first discovered to have diabetes in 1938, at which time she had pruritis and polyuria. The blood sugar was 440 mg. per 100 ml. in 1945 and 270 mg. per 100 ml. at the time of the survey film. The patient had been in diabetic coma in December 1945. She suffered hypoglycemia with unconsciousness in January 1946. She was 73 per cent of standard weight on February 18, 1946, when her photofluorogram was interpreted as far advanced, active tuberculosis with acute exudative infiltrations through most of the right lung, with pneumonic consolidation in the infraclavicular region. Scattered soft infiltrations were present in the left mid-lung (figure 4). Her tuberculosis was unknown prior to the survey film. The patient was admitted to Philadelphia General Hospital on

FIG. 4. F. G., a 22-year-old Negro female. Photofluorogram, February 18, 1946, interpreted "Far advanced, active." Sputum positive for tubercle bacilli.

February 27, 1946. Her sputum was positive for tubercle bacilli on admission. She died June 13, 1946.

Case 2. R. K., a 43-year-old white female, was attending a diabetic clinic regularly for four years before the survey film was taken. She had a history of so-called viral pneumonia in July 1946, for which she had been treated with sulfonamides without success. She continued to keep house and to circulate in the community despite fever, cough, and night sweats until November 11, 1946, when her survey film was read as far advanced, active tuberculosis. Soft infiltrations were present throughout the left lung, with a large cavity in the infraclavicular region and a motheaten appearance at the apex and in the mid-lung. Excavation was present over the right third rib anteriorly (figure 5). She was hospitalized at once, and her sputum was found to be positive for tubercle bacilli. Treatment consisted of a right mantle

(marginal) pneumothorax and a left thoracoplasty (figure 6). Her sputum was negative for tubercle bacilli in July 1950. She is still on a regimen of restricted activity.

Of the 261 cases of tuberculosis among the diabetics, 80, or 31 per cent, were classified as probably active on the basis of soft mottling or frank cavitation on the roentgenogram, three times higher a percentage than the figure for the

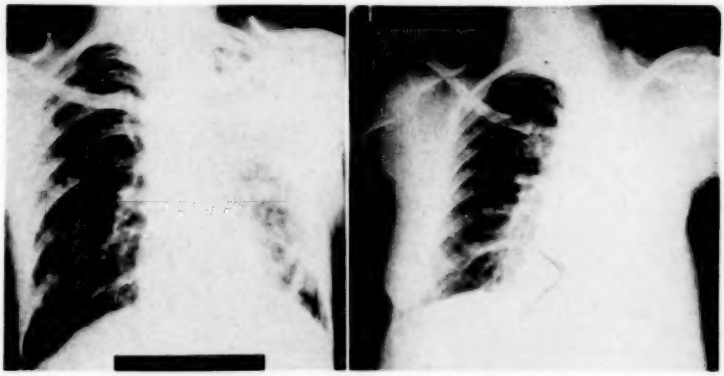

FIG. 5. (Left) R. K., a 43-year-old white female. Photofluorogram, November 11, 1946, read "Far advanced, active." Sputum positive for tubercle bacilli.

FIG. 6. (Right) R. K. Roentgenogram, 14- by 17-inch. Left thoracoplasty; re-expanded right pneumothorax; sputum negative for tubercle bacilli.

TABLE 17

PERCENTAGE OF ACTIVE CASES BY STAGE OF TUBERCULOSIS AND RACE IN TUBERCULOUS DIABETICS

STAGE	ALL RACES			WHITE			NON-WHITE		
	TB	Active	Per cent	TB	Active	Per cent	TB	Active	Per cent
All stages	261	80	30.7	224	64	28.6	37	16	43.2
Minimal	165	15	9.1	144	12	8.3	21	3	14.3
Advanced*	85	58	68.2	74	48	64.9	11	10	90.9
Pleural and pericarditis	8	4	50.0	4	2	50.0	4	2	50.0
Active primary	3	3	100.0	2	2	100.0	1	1	100.0

* Includes pneumothorax, thoracoplasty, and post-lobectomy cases.

comparison group (tables 17 and 18). As mentioned earlier (page 8), of the 51 diabetics known to have had tuberculosis prior to the survey, 36, or 70.6 per cent, had active disease. If these previously known cases were eliminated, the percentage of active tuberculosis, 21 per cent, among the diabetics was still twice that among those in the comparison group. The increased proportion of active cases was maintained in all stages and in both races.

In an attempt to evaluate socioeconomic factors, the percentage of active cases among clinic patients was contrasted with that among private physician referrals. The figure was 30.5 per cent for those attending clinics and 31.2 per cent for those referred by private physicians.

Cavities

Among 34 diabetics, 38 definite cavities were visible, while among 6 persons in the comparison group only 8 cavities were found. Questionable rarefaction or areas of honeycombing were not included. Of the 80 active diabetic cases, 42 per cent had cavities, while only 21 per cent of the 28 active comparison cases had cavities.

When active cases among the diabetics were divided into those previously known and those previously unknown, the percentage with cavities was 70 for the known cases and 21 for the others.

TABLE 18

PERCENTAGE OF ACTIVE CASES BY STAGE OF TUBERCULOSIS AND RACE IN COMPARISON GROUP

STAGE	ALL RACES			WHITE			NON-WHITE		
	TB	Active	Per cent	TB	Active	Per cent	TB	Active	Per cent
All stages	250	28	11.2	213	22	10.3	37	6	16.2
Minimal	184	6	3.3	157	6	3.8	27	—	—
Advanced*	59	21	35.6	50	16	32.0	9	5	55.6
Pleural and pericarditis	3	—	—	3	—	—	—	—	—
Active primary	1	1	100.0	—	—	—	1	1	100.0
Hematogenous and silicotuberculosis†	3	—	—	3	—	—	—	—	—

* Includes pneumothorax, thoracoplasty, and post-lobectomy cases.

† Includes 2 hematogenous and 1 case of silicotuberculosis.

The distribution by site of the cavities in the diabetics and in the comparison group is listed in appendix tables XXXVII and XXXVIII.

Course of Tuberculosis in the Diabetic

There is a clinical impression that tuberculosis in the diabetic runs a more acute course than in the non-diabetic. While a follow-up study on the tuberculous diabetics of the present study is planned, no systematic data are available to date. Several cases with an unusually acute course were encountered, however, and an example of one is presented in the following case report.

Case 3. J. H., an 18-year-old white male, was first found to have diabetes in 1941 because of weakness and fatigue. He was 96 per cent of standard weight at the time of the survey. His most recent five blood sugar values were 265, 243, 469, 120, and 268 mg. per 100 ml., consecutively. He had a history of contact with a tuberculous father. The photofluorogram of January 18, 1946 was considered "suspect" and a 14- by 17-inch retake was requested. The

large film taken on February 15, 1946 was interpreted as "minimal tuberculosis, activity indeterminate. Infiltrations in the right infraclavicular region" (figure 7). On December 30, 1946 he reported to the Tuberculosis Association's central unit, not realizing that any con-

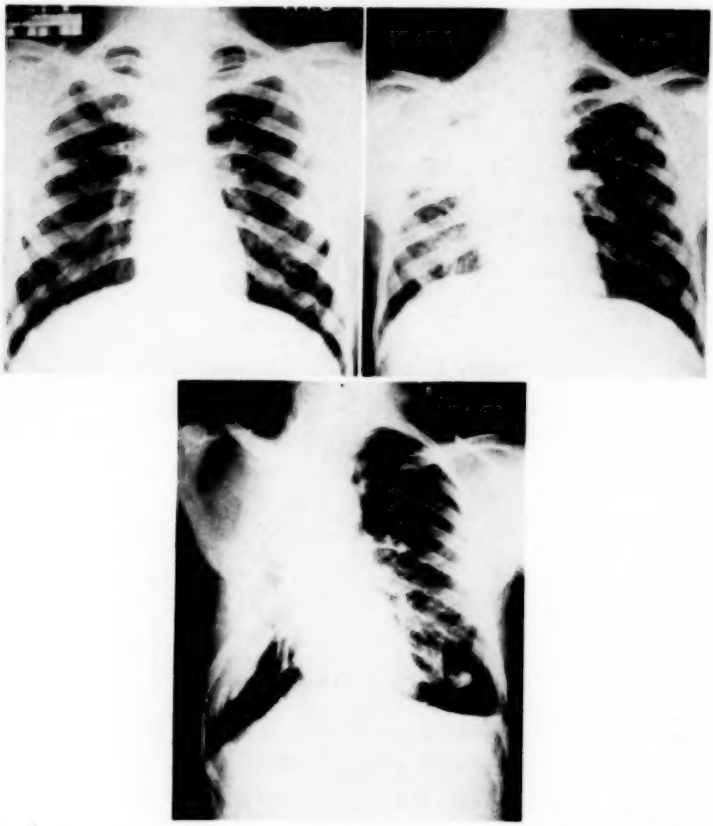

FIG. 7. (Left) J. H. Roentgenogram, 14- by 17-inch, February 15, 1946, interpreted as tuberculosis, "Minimal, activity indeterminate. Infiltrations right infraclavicular region."

FIG. 8. (Right) J. H. Roentgenogram, 14- by 17-inch, December 30, 1946, interpreted as tuberculosis, "Far advanced, active. Giant cavity occupies most of right upper lobe. There are infiltrations throughout balance of right lung and in the left third anterior interspace."

FIG. 9 (Bottom) J. H. Roentgenogram, 14- by 17-inch. Still hospitalized with sputum positive for tubercle bacilli despite right thoracoplasty and left pneumothorax.

nection existed between it and the diabetic survey. He stated that he had a severe cough and night sweats and thought he must have tuberculosis. A film taken at that time revealed far advanced bilateral tuberculosis with a giant cavity occupying the site of the

entire right upper lobe and infiltrations throughout the balance of the right lung and in the left third interspace (figure 8). He was admitted to Philadelphia General Hospital on February 4, 1947. A left mantle (marginal) pneumothorax was induced. A right thoracoplasty was carried out in two stages (figure 9). The patient was transferred to Eagleville Sanatorium on March 19, 1948. He is still hospitalized and had sputum positive for tubercle bacilli as of February 1951.

Despite the instances encountered, however, it would be most unwise, on the basis of a few cases, to support the thesis that tuberculosis in diabetics runs a more severe course than does tuberculosis in the non-diabetic.

DISCUSSION

Certain fundamental limitations in the nature of the Philadelphia Diabetic Survey must be recognized preliminary to evaluating its results. First, known diabetics only were studied. No attempt was made to do diabetic case finding for the study. Second, the proportion of clinic patients was 83 per cent. With no knowledge of the proportion of clinic patients among known diabetics in Philadelphia, it is possible that the study represents a disproportionately high percentage at the lower socioeconomic levels. Third, the diabetics surveyed are the survivors of a group whose characteristics remain unknown. For example, it is conceivable that diabetics who develop tuberculosis promptly after coma die so rapidly that our cases with a coma history are not representative.

Like all photofluorographic chest surveys, the present survey represents the situation at one given moment, is screening rather than diagnostic in nature, and is subject to the errors inherent in obtaining information by questionnaire.

The first question to be answered was whether or not the prevalence of tuberculosis is higher among diabetics than among non-diabetics. The tuberculosis prevalence was 8.4 per cent among the diabetics, twice that found in a group of apparently healthy industrial workers adjusted to a comparable age, race, and sex. It seems unlikely that this difference can be due entirely to factors other than diabetes.

Therefore, the next problem was to ascertain whether a relationship exists between certain diabetic factors and the increased tuberculosis prevalence. The mechanisms by which diabetes predisposes to tuberculosis must include endocrine and nutritional components outside the province of the present investigation. It was possible, however, to study the influence on tuberculosis prevalence of some aspects of diabetes. As in non-diabetics, it was to be expected that age, race, sex, standard weight, history of pleurisy, and contact with tuberculosis would affect the prevalence, so that these were also investigated. With respect to the last-named factors, the effects were generally similar to those noted in non-diabetics. Tuberculosis tended to increase with increasing age. If diabetes predisposes to tuberculosis, an increased tuberculosis prevalence would be expected among younger diabetics because of the more severe nature of their diabetes. Since this was not the case, the validity of considering diabetes a predisposing factor might be questioned. However, when active tuberculosis only was considered, the findings were quite different: 5.3 per cent of those younger than forty

had active tuberculosis in contrast with 1.7 per cent in those older than forty. This greater relevance of active tuberculosis to the factors under consideration was sustained throughout the study. Total tuberculosis prevalence did not always bear such an apparently direct relationship. This apparent inconsistency is probably due to the fact that fibrocalcific and strandlike lesions may antedate the diabetes. Therefore, the balance of the present discussion will be limited to active tuberculosis.

Twice as high a prevalence of tuberculosis was noted in persons below standard weight as in those above standard weight in the diabetics, a relationship similar to that in a group of industrial workers. However, the facts that diabetes is associated with weight loss and that accepted diabetic therapy emphasizes the desirability of reducing diabetics to, or slightly below, standard weight make it worth while to emphasize the increased prevalence of tuberculosis in the diabetics below standard weight.

A direct correlation existed between increasing severity of diabetes and increasing prevalence of active tuberculosis (table 8). This is strong evidence in support of the thesis that diabetes does predispose to tuberculosis.

One of the reasons for the increased prevalence of tuberculosis with increasing age in the general population is the increased opportunity for infection. It was anticipated that, since the data strongly suggested that diabetes predisposes to tuberculosis, the presence of diabetes of increasing durations would result in increasing rates of tuberculosis prevalence through a similar mechanism. This was not found to be the case. Persons younger than forty had an increasing tuberculosis prevalence with increasing duration of diabetes but there was no such correlation in those older than forty. These findings remain unexplained.

The effect of control as measured by five recent blood sugar analyses was difficult to evaluate. In diabetics who were receiving more than 40 units of insulin, there was a greatly increased prevalence of active tuberculosis among those with good control, possibly due to meticulous efforts to maintain normal blood sugar values in the presence of symptoms actually due to tuberculosis. On the other hand, 5 recent blood sugar values may not necessarily reflect the status of the diabetes at the time of the onset of tuberculosis.

No correlation was demonstrated between history of coma and active tuberculosis. Since coma is evidence of uncontrolled diabetes, the lack of relationship between coma history and active tuberculosis tends to increase the difficulty of evaluating the role of control in diabetic predisposition to tuberculosis.

Another unexpected finding was the fact that there was no greater prevalence of tuberculosis among those with a history of gangrene, amputation, boils, or carbuncles than in the diabetics without such histories.

So far as tuberculosis in the diabetic is concerned, the survey revealed twice as much total tuberculosis as in a comparable group of non-diabetics. There was three times as much active tuberculosis among the diabetics as in a sample of tuberculous non-diabetics matched by age, race, and sex. Not only does the diabetic have more tuberculosis, but the tuberculosis he has is likely to be of more significant character.

There was no appreciable difference in the amount of active tuberculosis in the lower two-thirds of the lung fields between the diabetic and the comparsion group. However, both of these groups had active tuberculosis confined to the lower two-thirds in more than half of the total cases, suggesting that age rather than diabetes may be the factor responsible for the impression that diabetics have more basal tuberculosis.

SUMMARY

The prevalence of tuberculosis was 8.4 per cent among 3,106 Philadelphia diabetics surveyed in 1946. This was twice as high as the prevalence in a group of apparently healthy industrial workers adjusted for age, race, and sex.

The diabetics younger than forty had a prevalence of active tuberculosis of 5.3 per cent, as contrasted with 1.7 per cent for those older than forty.

The diabetics younger than forty had a tuberculosis prevalence of 5 per cent with diabetes of less than ten years' duration, while the tuberculosis prevalence was 17 per cent when the diabetes had been present for more than ten years. This relationship was not noted in persons older than forty years of age. The situation was similar when active tuberculosis only was considered.

The prevalence of active tuberculosis increased from approximately 1.5 per cent for those who received no insulin or no more than 40 units to 5.3 per cent for those who received more than 40 units each day.

As in non-diabetics, the prevalence of tuberculosis was twice as high among those below standard weight as among those above standard weight. This effect was independent of age, severity, and impression of activity. Since accepted diabetic therapy emphasizes the desirability of reducing diabetics to, or slightly below, standard weight, it seems worth while to emphasize the increased prevalence of tuberculosis in the diabetics below standard weight.

The difference between the 261 tuberculous diabetics and a non-diabetic comparison group adjusted for age, race, and sex could, in general, be accounted for by the fact that the diabetics had a higher percentage of active tuberculosis, 31 per cent, as contrasted with 11 per cent in the comparison group.

Acknowledgment

The authors wish to express their thanks to Miss Mildred Ortals for invaluable assistance in interviewing diabetics referred by private physicians, record-keeping, and the preparation of the manuscript, and to Mrs. R. H. Lea and the members of the Emergency Aid of Pennsylvania who, under her guidance, interviewed the patients attending diabetic clinics.

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APPENDIX

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TABLE I

Age Distribution of Diabetic Survey Population, by Race and Sex

Age at survey (years)	All races						White						Non-white					
	Total		Male		Female		Total		Male		Female		Total		Male		Female	
	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution
All ages	3,106		953		2,153		2,245		769		1,476		861		184		677	
Under 5	3	0.1	1	0.1	2	0.1	3	0.1	1	0.1	2	0.1	—	—	—	—	—	—
5–9	9	0.3	4	0.4	5	0.2	7	0.3	2	0.3	5	0.3	2	0.2	2	1.1	—	—
10–14	42	1.4	23	2.4	19	0.9	37	1.7	20	2.6	17	1.2	5	0.6	3	1.6	2	0.3
15–19	54	1.8	28	3.0	26	1.2	49	2.2	24	3.1	25	1.7	5	0.6	4	2.2	1	0.1
20–24	64	2.1	30	3.2	34	1.6	56	2.5	28	3.7	28	1.9	8	0.9	2	1.1	6	0.9
25–29	66	2.1	32	3.4	34	1.6	52	2.3	31	4.1	21	1.4	14	1.6	1	0.5	13	1.9
30–34	70	2.3	29	3.1	41	1.9	55	2.5	25	3.3	30	2.0	15	1.8	4	2.2	11	1.6
35–39	122	4.0	45	4.8	77	3.6	80	3.6	33	4.3	47	3.2	42	4.9	12	6.6	30	4.5
40–44	181	5.9	53	5.6	128	6.0	95	4.3	36	4.7	59	4.0	86	10.0	17	9.3	69	10.2
45–49	275	8.9	81	8.6	194	9.1	163	7.3	64	8.4	99	6.8	112	13.1	17	9.3	95	14.1
50–54	422	13.7	104	11.0	318	14.9	280	12.6	79	10.4	201	13.7	142	16.6	25	13.7	117	17.4
55–59	502	16.3	131	13.9	371	17.3	347	15.6	103	13.5	244	16.7	155	18.1	28	15.4	127	18.8
60–64	497	16.1	143	15.1	354	16.5	385	17.3	111	14.6	274	18.7	112	13.1	32	17.6	80	11.9
65–69	417	13.5	105	11.1	312	14.6	316	14.2	90	11.8	226	15.4	101	11.8	15	8.2	86	12.8
70–74	233	7.6	79	8.4	154	7.2	199	8.9	70	9.2	129	8.8	34	4.0	9	4.9	25	3.7
75–79	98	3.2	42	4.4	56	2.6	81	3.6	35	4.6	46	3.1	17	2.0	7	3.8	10	1.5
80–84	26	0.8	13	1.4	13	0.6	21	0.9	10	1.3	11	0.8	5	0.6	3	1.6	2	0.3
85–89	2	0.1	1	0.1	1	0.05	1	0.04	—	—	1	0.07	1	0.1	1	0.5	—	—
Unknown*	23		9		14		18		7		11		5		2		3	

* Not included in per cent computation.

TABLE II

Duration of Diabetes

DURATION OF DIABETES (YEARS)	NUMBER OF DIABETICS	PER CENT DISTRIBUTION
All durations	3,106	
Under 10	1,961	64.8
Under 5	1,080	35.7
5–9	881	29.1
10 and over	1,067	35.2
10–14	566	18.7
15–19	315	10.4
20–24	128	4.2
25 and over	58	1.9
Unknown*	78	

* Not included in per cent computation.

TABLE III

Insulin Dosage

INSULIN DOSAGE (UNITS)	NUMBER OF DIABETICS	PER CENT DISTRIBUTION
All dosages	3,106	
No insulin	743	24.5
1–40	1,760	58.0
1–10	299	9.9
11–20	610	20.1
21–30	486	16.0
31–40	365	12.0
41 and over	532	17.5
41–50	207	6.8
51–60	131	4.3
61–70	66	2.2
71 and over	128	4.2
Unknown*	71	

* Not included in per cent computation.

TABLE IV

Insulin Dosage by Age at Survey

INSULIN DOSAGE (UNITS)	ALL AGES		0–19		20–39		40–59		60 AND OVER		UNKNOWN
	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution	Number
All dosages	3,106		108		322		1,380		1,273		23
No insulin	743	24.5	3	2.8	34	11.0	372	27.4	330	26.3	4
1–20	909	30.0	12	11.3	50	16.1	394	29.1	452	36.0	1
21–40	851	28.0	24	22.6	100	32.3	381	28.1	345	27.5	1
41–60	338	11.1	35	33.0	79	25.5	131	9.7	92	7.3	1
60 and over	194	6.4	32	30.2	47	15.2	78	5.8	37	2.9	—
Unknown*	71		2		12		24		17		16

* Not included in per cent computation.

TABLE V

History of Coma by Age at Survey

AGE AT SURVEY (YEARS)	NUMBER OF DIABETICS	NUMBER OF DIABETICS WITH HISTORY OF COMA	PER CENT	NUMBER OF DIABETICS WITH HISTORY OF COMA UNKNOWN*
All ages	3,106	516	17.0	70
Under 40	430	167	39.4	6
40–59	1,380	192	14.2	26
60 and over	1,273	154	12.4	27
Unknown	23	3		11

* Not included in per cent computation.

TABLE VI

History of Coma by Age at Onset of Diabetes

AGE AT ONSET OF DIABETES SURVEY (YEARS)	NUMBER OF DIABETICS	NUMBER OF DIABETICS WITH HISTORY OF COMA	PER CENT	NUMBER OF DIABETICS WITH HISTORY OF COMA UNKNOWN*
All ages	3,106	516	17.0	70
Under 20	215	110	51.6	2
20–39	549	130	23.8	3
40 and over	2,258	273	12.2	27
Unknown	84	3		38

* Not included in per cent computation.

TABLE VII

Standard Weight Distribution by Age at Survey

AGE AT SURVEY (YEARS)	NUMBER OF DIABETICS	BELOW STANDARD WEIGHT		AT STANDARD WEIGHT		ABOVE STANDARD WEIGHT		UNKNOWN*
		Number	Per cent	Number	Per cent	Number	Per cent	Number
All ages	3,106	806	26.4	770	25.3	1,472	48.3	58
Under 40	430	161	37.8	134	31.5	131	30.8	4
Under 10	12	2	16.7	8	66.7	2	16.7	—
10–19	96	36	37.9	32	33.7	27	28.4	1
20–29	130	57	44.2	44	34.1	28	21.7	1
30–39	192	66	34.7	50	26.3	74	38.9	2
40 and over	2,653	644	24.6	636	24.3	1,336	51.1	37
40–49	456	109	24.2	84	18.7	257	57.1	6
50–59	924	197	21.5	213	23.3	505	55.2	9
60–69	914	228	25.4	235	26.1	436	48.5	15
70–79	331	96	29.4	95	29.1	135	41.4	5
80–89	28	14	53.8	9	34.6	3	11.5	2
Unknown	23	1		—		5		17

* Not included in per cent computation.

TABLE VIII

Comparison of Diabetic Survey Group with Industrial Group

(Adjusted for Age, Race, and Sex)

Age at survey (years)	White males						White females					
	Industrial			Diabetic			Industrial			Diabetic		
	Number examined	TB	Per cent	Number examined	Cases expected	TB	Number examined	TB	Per cent	Number examined	Cases expected	TB
All ages	38,998	1,058		739	43.3	102	16,620	267		1,441	64.2	110
15-24	7,001	36	0.5	52	0.3	3	8,874	69	0.8	53	0.4	1
25-34	11,078	148	1.3	56	0.7	9	3,678	59	1.6	51	0.8	4
35-44	9,515	251	2.7	69	1.9	9	2,375	71	3.0	106	3.2	8
45-54	8,533	414	4.9	143	7.0	13	1,402	53	3.8	300	11.4	16
55-64	2,531	167	6.6	214	14.1	36	271	15	5.2	518	48.4	39
65 and over	340	32	9.4	205	19.3	32	20	—		413		42
Unknown*	4*	—		7*	—	6*	—	—		11*	—	5*

Age at survey (years)	Non-white males						Non-white females					
	Industrial			Diabetic			Industrial			Diabetic		
	Number examined	TB	Per cent	Number examined	Cases expected	TB	Number examined	TB	Per cent	Number examined	Cases expected	TB
All ages	12,200	241		177	5.3	7	3,942	67		672	18.6	28
15-24	2,325	31	1.3	6	0.1	—	1,577	15	1.0	7	0.1	3
25-34	3,481	56	1.6	5	0.1	—	1,412	30	2.1	24	0.5	1
35-44	3,381	63	1.9	29	0.6	—	701	15	2.1	99	2.8	2
45-54	2,407	69	2.9	42	1.2	2	228	4		213		7
55-64	544	20	3.7	60	2.2	4	24	3	2.8	207	15.2	11
65 and over	62	2	3.2	35	1.1	1	—	—		123		4
Unknown*	—	—		2*	—	—	—	—		3*	—	—

* Not included in computation.

TABLE IX

Prevalence of Tuberculosis by Age at Survey, Race, and Sex

Age at survey (years)	Total			White						Non-white					
				Male			Female			Male			Female		
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent
All ages	3,106	261	8.4	769	109	14.2	1,476	115	7.8	184	8	4.3	677	29	4.3
Under 40	430	33	7.7	164	20	12.2	175	7	4.0	28	1	3.6	63	5	7.9
Under 5	3	—	—	1	—	—	2	—	—	—	—	—	—	—	—
5-9	9	1	11.1	2	—	—	5	—	—	2	1	50.0	—	—	—
10-14	42	2	4.8	20	1	5.0	17	—	—	3	—	—	2	1	50.0
15-19	54	3	5.6	24	2	8.3	25	1	4.0	4	—	—	1	—	—
20-24	64	4	6.2	28	1	3.6	28	—	—	2	—	—	6	3	50.0
25-29	66	7	10.6	31	5	16.1	21	1	4.8	1	—	—	13	1	7.7
30-34	70	7	10.0	25	4	16.0	30	3	10.0	4	—	—	11	—	—
35-39	122	9	7.4	33	7	21.2	47	2	4.3	12	—	—	30	—	—
40 and over	2,653	217	8.2	598	83	13.9	1,290	103	8.0	154	7	4.5	611	24	3.9
40-44	181	10	5.5	36	2	5.6	59	6	10.2	17	—	—	69	2	2.9
45-49	275	19	6.9	64	5	7.8	99	8	8.1	17	2	11.8	95	4	4.2
50-54	422	19	4.5	79	8	10.1	201	8	4.0	25	—	—	117	3	2.6
55-59	502	43	8.6	103	16	15.5	244	20	8.2	28	1	3.6	127	6	4.7
60-64	497	47	9.5	111	20	18.0	274	19	6.9	32	3	9.4	80	5	6.2
65-69	417	46	11.0	90	17	18.9	226	24	10.6	15	1	6.7	86	4	4.7
70-74	233	20	8.6	70	9	12.9	129	11	8.5	9	—	—	25	—	—
75 and over	126	13	10.3	45	6	13.3	58	7	12.1	11	—	—	12	—	—
Unknown	23	11		7	6		11	5		2	—		3	—	

TABLE X

Prevalence of Active Tuberculosis by Age at Survey, Race, and Sex

Age at survey (years)	Total			White						Non-white					
				Male			Female			Male			Female		
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent
All ages	3,106	80	2.6	769	40	5.2	1,476	24	1.6	184	5	2.7	677	11	1.6
Under 40	430	23	5.3	164	12	7.3	175	5	2.9	28	1	3.6	63	5	7.9
Under 5	3	—	—	1	—	—	2	—	—	—	—	—	—	—	—
5-9	9	1	11.1	2	—	—	5	—	—	2	1	50.0	—	—	—
10-14	42	3	7.1	20	2	10.0	17	—	—	3	—	—	2	1	50.0
15-19	54	1	1.9	24	—	—	25	1	4.0	4	—	—	1	—	—
20-24	64	4	6.2	28	1	3.6	28	—	—	2	—	—	6	3	50.0
25-29	66	5	7.6	31	3	9.7	21	1	4.8	1	—	—	13	1	7.7
30-34	70	4	5.7	25	3	12.0	30	1	3.3	4	—	—	11	—	—
35-39	122	5	4.1	33	3	9.1	47	2	4.3	12	—	—	30	—	—
40 and over	2,653	46	1.7	508	22	3.7	1,290	14	1.1	154	4	2.6	611	6	1.0
40-44	181	4	2.2	36	1	2.8	59	3	5.1	17	—	—	69	—	—
45-49	275	6	2.2	64	2	3.1	99	—	—	17	2	11.8	95	2	2.1
50-54	422	4	0.9	79	3	3.8	201	1	0.5	25	—	—	117	—	—
55-59	502	9	1.8	103	4	3.9	244	3	1.2	28	1	3.6	127	1	0.8
60-64	497	9	1.8	111	5	4.5	274	1	0.4	32	1	3.1	80	2	2.5
65-69	417	8	1.9	90	3	3.3	226	4	1.8	15	—	—	86	1	1.2
70-74	233	2	0.9	70	1	1.4	129	1	0.8	9	—	—	25	—	—
75 and over	126	4	3.2	45	3	6.7	58	1	1.7	11	—	—	12	—	—
Unknown	23	11		7	6		11	5		2	—		3	—	

TABLE XI

Prevalence of Tuberculosis by Duration and Age at Onset

Duration of diabetes (years)	All ages			Under 20 years			20 years and over			Unknown	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All durations	3,106	261	8.4	215	22	10.2	2,807	217	7.7	84	22
Under 10	1,961	147	7.5	129	8	6.2	1,826	137	7.5	6	2
10 and over	1,067	94	8.8	86	14	16.3	981	80	8.2	—	—
Unknown	78	20		—	—		—	—		78	20

TABLE XII

Prevalence of Active Tuberculosis by Duration and Age at Onset

Duration of diabetes (years)	All ages			Under 20 years			20 years and over			Unknown	
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All durations	3,106	80	2.6	215	16	7.4	2,807	50	1.8	84	14
Under 10	1,961	44	2.2	129	6	4.7	1,826	36	2.0	6	2
10 and over	1,067	24	2.2	86	10	11.6	981	14	1.4	—	—
Unknown	78	12		—	—		—	—		78	12

TABLE XIII

PREVALENCE OF TUBERCULOSIS BY INSULIN DOSAGE AND AGE AT ONSET

INSULIN DOSAGE (UNITS)	ALL AGES			UNDER 20 YEARS			20 YEARS AND OVER			UNKNOWN	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All dosages	3,106	261	8.4	215	22	10.2	2,807	217	7.7	84	22
No insulin	743	68	9.2	3	1	33.3	727	63	8.7	13	4
1–40	1,760	131	7.4	69	3	4.3	1,672	124	7.4	19	4
41 and over	532	46	8.6	140	17	12.1	384	28	7.3	8	1
Unknown	71	16		3	1		24	2		44	13

TABLE XIV

PREVALENCE OF ACTIVE TUBERCULOSIS BY INSULIN DOSAGE AND AGE AT ONSET

INSULIN DOSAGE (UNITS)	ALL AGES			UNDER 20 YEARS			20 YEARS AND OVER			UNKNOWN	
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All dosages	3,106	80	2.6	215	16	7.4	2,807	50	1.8	84	14
No insulin	743	10	1.3	3	1	33.3	727	8	1.1	13	1
1–40	1,760	30	1.7	69	3	4.3	1,672	25	1.5	19	2
41 and over	532	28	5.3	140	12	8.6	384	15	3.9	8	1
Unknown	78	12		3	—		21	2		44	10

TABLE XV

PREVALENCE OF TUBERCULOSIS BY CONTROL (BLOOD SUGAR VALUES) AND INSULIN DOSAGE

CONTROL	TOTAL			NO INSULIN			1–40 UNITS			41 AND OVER			UNKNOWN	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All groups	3,106	261	8.4	743	68	9.2	1,760	131	7.4	532	46	8.6	71	16
Good	1,281	112	8.7	478	46	9.6	705	49	7.0	87	13	14.9	11	4
Fair	1,230	105	8.5	154	10	6.5	773	68	8.8	288	25	8.7	15	2
Poor	458	26	5.7	79	7	8.9	236	10	4.2	138	8	5.8	5	1
Unknown	137	18		32	5		46	4		19	—		40	9

TABLE XVI

PREVALENCE OF ACTIVE TUBERCULOSIS BY CONTROL (BLOOD SUGAR VALUES) AND INSULIN DOSAGE

CONTROL	TOTAL			NO INSULIN			1–40 UNITS			41 AND OVER			UNKNOWN	
	Number	Active	per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All groups	3,106	80	2.6	743	10	1.3	1,760	30	1.7	532	28	5.3	71	12
Good	1,281	31	2.4	478	6	1.3	705	12	1.7	87	9	10.3	11	4
Fair	1,230	34	2.8	154	1	0.6	773	16	2.1	288	15	5.2	15	2
Poor	458	8	1.7	79	2	2.5	236	1	0.4	138	4	2.9	5	1
Unknown	137	7		32	1		46	1		19	—		40	5

TABLE XVII

PREVALENCE OF TUBERCULOSIS BY AGE AT SURVEY, COMA, AND DURATION

HISTORY OF COMA	TOTAL			UNDER 10 YEARS			10 YEARS AND OVER			UNKNOWN	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All ages											
Coma	516	41	7.9	282	15	5.3	226	23	10.2	8	3
No coma	2,520	206	8.2	1,661	129	7.8	827	69	8.3	32	8
Unknown	70	14		18	3		14	2		38	9
Under 40 years											
Coma	167	16	9.6	103	5	4.9	63	11	17.5	1	—
No coma	257	15	5.8	205	9	4.4	49	6	12.2	3	—
Unknown	6	2		1	—		2	2		3	—
40 years and over											
Coma	346	24	6.9	178	10	5.6	163	12	7.4	5	2
No coma	2,254	185	8.2	1,451	118	8.1	778	63	8.1	25	4
Unknown	53	8		17	3		12	—		24	5
Unknown											
Coma	3	1		1	—		—	—		2	1
No coma	9	6		5	2		—	—		4	4
Unknown	11	4		—	—		—	—		11	4

TABLE XVIII

PREVALENCE OF ACTIVE TUBERCULOSIS BY AGE AT SURVEY, COMA, AND DURATION

HISTORY OF COMA	TOTAL			UNDER 10 YEARS			10 YEARS AND OVER			UNKNOWN	
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All ages											
Coma	516	16	3.1	282	5	1.8	226	9	4.0	8	2
No coma	2,520	55	2.2	1,661	37	2.2	827	14	1.7	32	4
Unknown	70	9		18	2		14	1		38	6
Under 40 years											
Coma	167	10	6.0	103	3	2.9	63	7	11.1	1	—
No coma	257	12	4.7	205	7	3.4	49	5	10.2	3	—
Unknown	6	1		1	—		2	1		3	—
40 years and over											
Coma	346	5	1.4	178	2	1.1	163	2	1.2	5	1
No coma	2,254	37	1.6	1,451	28	1.9	778	9	1.2	25	—
Unknown	53	4		17	2		12	—		24	2
Unknown											
Coma	3	1		1	—		—	—		2	1
No coma	9	6		5	2		—	—		4	4
Unknown	11	4		—	—		—	—		11	4

TABLE XIX

PREVALENCE OF TUBERCULOSIS BY STANDARD WEIGHT AND AGE IN 2,275 INDUSTRIAL WORKERS

AGE (YEARS)	TOTAL			BELOW STANDARD WEIGHT			AT STANDARD WEIGHT			ABOVE STANDARD WEIGHT		
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent
All ages	2,275	69	3.0	739	31	4.2	736	20	2.7	800	18	2.2
Under 40	1,383	18	1.3	428	7	1.6	478	5	1.0	477	6	1.3
15–19	74	1	1.4	19	—	—	35	—	—	20	1	5.0
20–24	330	1	0.3	112	—	—	112	1	0.9	106	—	—
25–29	356	5	1.4	102	1	1.0	138	3	2.2	116	1	0.9
30–34	363	4	1.1	107	2	1.9	113	—	—	143	2	1.4
35–39	260	7	2.7	88	4	4.5	80	1	1.2	92	2	2.2
40 and over	892	51	5.7	311	24	7.7	258	15	5.8	323	12	3.7
40–44	271	9	3.3	89	5	5.6	80	1	1.2	102	3	2.9
45–49	217	11	5.1	82	7	8.5	62	3	4.8	73	1	1.4
50–54	189	13	6.9	57	4	7.0	51	5	9.8	81	4	4.9
55–59	115	11	9.6	47	3	6.4	30	5	16.7	38	3	7.9
60–64	78	6	7.7	25	5	20.0	30	—	—	23	1	4.3
65–69	19	1	5.3	9	—	—	4	1	25.0	6	—	—
70–74	3	—	—	2	—	—	1	—	—	—	—	—

TABLE XX

PREVALENCE OF TUBERCULOSIS BY INSULIN DOSAGE AND STANDARD WEIGHT

STANDARD WEIGHT	TOTAL			NO INSULIN			1–40 UNITS			41 AND OVER			UNKNOWN	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All groups	3,106	261	8.4	743	68	9.2	1,760	131	7.4	532	46	8.6	71	16
Below standard weight	806	96	11.9	152	24	15.8	490	54	11.0	157	17	10.8	7	1
At standard weight	770	72	9.4	188	23	12.2	446	37	8.3	129	11	8.5	7	1
Above standard weight	1,472	78	5.3	401	21	5.2	813	38	4.7	245	18	7.3	13	1
Unknown standard weight	58	15		2	—		11	2		1	—		44	13

TABLE XXI

PREVALENCE OF ACTIVE TUBERCULOSIS BY INSULIN DOSAGE AND STANDARD WEIGHT

STANDARD WEIGHT	TOTAL			NO INSULIN			1–40 UNITS			41 AND OVER			UNKNOWN	
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All groups	3,106	80	2.6	743	10	1.3	1,760	30	1.7	532	28	5.3	71	12
Below standard weight	806	36	4.5	152	4	2.6	490	19	3.9	157	12	7.6	7	1
At standard weight	770	18	2.3	188	3	1.6	446	6	1.3	129	8	6.2	7	1
Above standard weight	1,472	14	1.0	401	3	0.7	813	3	0.4	245	8	3.3	13	—
Unknown standard weight	58	12		2	—		11	2		1	—		44	10

TABLE XXII

PREVALENCE OF TUBERCULOSIS BY CONTROL (BLOOD SUGAR VALUES) AND STANDARD WEIGHT

STANDARD WEIGHT	TOTAL			GOOD CONTROL			FAIR CONTROL			POOR CONTROL			UNKNOWN	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All groups	3,106	261	8.4	1,281	112	8.7	1,230	105	8.5	458	26	5.7	137	18
Below standard weight	806	96	11.9	320	44	13.8	328	38	11.6	121	9	7.4	37	5
At standard weight	770	72	9.4	358	35	9.8	292	25	8.6	99	9	9.1	21	3
Above standard weight	1,472	78	5.3	593	31	5.2	601	38	6.3	237	7	3.0	41	2
Unknown standard weight	58	15		10	2		9	4		1	1		38	8

TABLE XXIII

PREVALENCE OF ACTIVE TUBERCULOSIS BY CONTROL (BLOOD SUGAR VALUES) AND STANDARD WEIGHT

STANDARD WEIGHT	TOTAL			GOOD CONTROL			FAIR CONTROL			POOR CONTROL			UNKNOWN	
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All groups	3,106	80	2.6	1,281	31	2.4	1,230	34	2.8	458	8	1.7	137	7
Below standard weight	806	36	4.5	320	14	4.4	328	17	5.2	121	3	2.5	37	2
At standard weight	770	18	2.3	358	10	2.8	292	6	2.1	99	2	2.0	21	—
Above standard weight	1,472	14	1.0	593	5	0.8	601	7	1.2	237	2	0.8	41	—
Unknown standard weight	58	12		10	2		9	4		1	1		38	5

TABLE XXIV

PREVALENCE OF TUBERCULOSIS BY AGE AT SURVEY, INSULIN DOSAGE, AND STANDARD WEIGHT

INSULIN DOSAGE (UNITS)	UNDER STANDARD WEIGHT			AT STANDARD WEIGHT			ABOVE STANDARD WEIGHT			UNKNOWN	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All ages											
No insulin	152	24	15.8	188	23	12.2	401	21	5.2	2	—
1–40	490	54	11.0	446	37	8.3	813	38	4.7	11	2
41 and over	157	17	10.8	129	11	8.5	245	18	7.3	1	—
Unknown	7	1		7	1		13	1		44	13
Under 40 years											
No insulin	6	1	16.7	8	1	12.5	23	—	—	—	—
1–40	76	2	2.6	55	4	7.3	55	—	—	—	—
41 and over	74	9	12.2	69	9	13.0	50	6	12.0	—	—
Unknown	5	—		2	—		3	—		4	1
40 years and over											
No insulin	146	23	15.8	180	22	12.2	375	20	5.3	1	—
1–40	413	51	12.3	391	33	8.4	757	38	5.0	11	2
41 and over	83	8	9.6	60	2	3.3	194	12	6.2	1	—
Unknown	2	1		5	1		10	1		24	3
Unknown											
No insulin	—	—		—	—		3	1		1	—
1–40	1	1		—	—		1	—		—	—
41 and over	—	—		—	—		1	—		—	—
Unknown	—	—		—	—		—	—		16	9

TABLE XXV

PREVALENCE OF ACTIVE TUBERCULOSIS BY AGE AT SURVEY, INSULIN DOSAGE, AND STANDARD WEIGHT

INSULIN DOSAGE (UNITS)	UNDER STANDARD WEIGHT			AT STANDARD WEIGHT			ABOVE STANDARD WEIGHT			UNKNOWN	
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All ages											
No insulin	152	4	2.6	188	3	1.6	401	3	0.7	2	—
1–40	490	19	3.9	446	6	1.3	813	3	0.4	11	2
41 and over	157	12	7.6	129	8	6.2	245	8	3.3	1	—
Unknown	7	1		7	1		13	—		44	10
Under 40 years											
No insulin	6	1	16.7	8	—	—	23	—	—	—	—
1–40	76	2	2.6	55	3	5.5	55	—	—	—	—
41 and over	74	7	9.5	69	6	8.7	50	4	8.0	—	—
Unknown	5	—		2	—		3	—		4	—
40 years and over											
No insulin	146	3	2.1	180	3	1.7	375	2	0.5	1	—
1–40	413	16	3.9	391	3	0.8	757	3	0.4	11	2
41 and over	83	5	6.0	60	2	3.3	194	4	2.1	1	—
Unknown	2	1		5	1		10	—		24	1
Unknown											
No insulin	—	—		—	—		3	1		1	—
1–40	1	1		—	—		1	—		—	—
41 and over	—	—		—	—		1	—		—	—
Unknown	—	—		—	—		—	—		16	9

TABLE XXVI

PREVALENCE OF TUBERCULOSIS BY HISTORY OF CONTACT AND STANDARD WEIGHT

HISTORY OF CONTACT	TOTAL			UNDER STANDARD WEIGHT			AT STANDARD WEIGHT			ABOVE STANDARD WEIGHT			UNKNOWN	
	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB	Per cent	Number	TB
All groups	3,106	261	8.4	806	96	11.9	770	72	9.4	1,472	78	5.3	58	15
Contact	298	35	11.7	87	16	18.4	75	9	12.0	134	9	6.7	2	1
No contact	2,620	192	7.3	677	73	10.8	659	58	8.8	1,275	60	4.7	9	1
Unknown	188	34		42	7		36	5		63	9		47	13

TABLE XXVII

PREVALENCE OF ACTIVE TUBERCULOSIS BY HISTORY OF CONTACT AND STANDARD WEIGHT

HISTORY OF CONTACT	TOTAL			UNDER STANDARD WEIGHT			AT STANDARD WEIGHT			ABOVE STANDARD WEIGHT			UNKNOWN	
	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active	Per cent	Number	Active
All groups	3,106	80	2.6	806	36	4.5	770	18	2.3	1,472	14	1.0	58	12
Contact	298	11	3.7	87	6	7.0	75	2	2.7	134	3	2.2	2	—
No contact	2,620	48	1.8	677	26	3.8	659	12	1.8	1,275	7	0.6	9	1
Unknown	188	23		42	4		36	4		63	4		47	11

TABLE XXVIII

PREVALENCE OF TUBERCULOSIS AND ACTIVE TUBERCULOSIS BY HISTORY OF PLEURISY

HISTORY OF PLEURISY	NUMBER	TB	PER CENT	ACTIVE	PER CENT
History of pleurisy	457	42	9.2	19	4.2
No history of pleurisy	2,451	184	7.5	44	1.8
Unknown	198	35		17	

TABLE XXIX

PREVALENCE OF TUBERCULOSIS AND ACTIVE TUBERCULOSIS BY GANGRENE AND/OR AMPUTATION

HISTORY OF GANGRENE AND/OR AMPUTATION	NUMBER	TB	PER CENT	ACTIVE	PER CENT
Gangrene and/or amputation	219	16	7.3	2	0.9
No gangrene; no amputation	2,789	220	7.9	63	2.3
Unknown	98	25		15	

TABLE XXX

PREVALENCE OF TUBERCULOSIS AND ACTIVE TUBERCULOSIS BY BOILS AND/OR CARBUNCLES

HISTORY OF BOILS OR CARBUNCLES	NUMBER	TB	PER CENT	ACTIVE	PER CENT
Boils and/or carbuncles	427	31	7.3	10	2.3
No boils or carbuncles	2,600	207	8.0	54	2.1
Unknown	79	23		16	

TABLE XXXI

SITE OF LESIONS BY ACTIVITY AND RACE IN TUBERCULOUS DIABETICS

(All Cases with Parenchymal Involvement)

THIRDS	ALL CASES		ACTIVE		OTHER THAN ACTIVE	
	Number	Per cent	Number	Per cent	Number	Per cent
All races						
Total persons	248*		75		173	
Upper	209	84.3	56	74.7	153	88.4
Middle	89	35.9	43	57.3	46	26.6
Lower	43	17.3	24	32.0	19	11.0
White						
Total persons	215		61		154	
Upper	182	84.7	47	77.0	135	87.7
Middle	76	35.3	34	55.7	42	27.3
Lower	36	16.7	19	31.1	17	11.0
Non-white						
Total persons	33		14		19	
Upper	27	81.8	9	64.3	18	94.7
Middle	13	39.4	9	64.3	4	21.1
Lower	7	21.2	5	35.7	2	10.5

* 13 cases without visible parenchymal involvement excluded.

TABLE XXXII

SITE OF LESIONS BY ACTIVITY AND RACE IN COMPARISON GROUP

(All Cases with Parenchymal Involvement)

THIRDS	ALL CASES		ACTIVE		OTHER THAN ACTIVE	
	Number	Per cent	Number	Per cent	Number	Per cent
All races						
Total persons	246*		27		219	
Upper	220	89.4	18	66.7	202	92.3
Middle	53	21.6	12	44.4	47	21.5
Lower	37	15.0	14	51.8	25	11.4
White						
Total persons	210		22		188	
Upper	191	91.0	15	68.2	176	93.6
Middle	46	21.9	9	40.9	37	19.7
Lower	32	15.2	11	50.0	21	11.2
Non-white						
Total persons	36		5		31	
Upper	29	80.6	3	60.0	26	83.9
Middle	13	36.1	3	60.0	10	32.3
Lower	7	19.4	3	60.0	4	12.9

* 4 cases without visible parenchymal involvement excluded.

TABLE XXXIII

SITE OF LESIONS BY ACTIVITY AND RACE IN TUBERCULOUS DIABETICS

(Limited to Cases with Involvement of Only One Lung Third)

THIRDS	ALL CASES		ACTIVE		OTHER THAN ACTIVE	
	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution
All races						
All sites	130	100.	27	100.	103	100.
Upper	98	75.4	12	44.4	86	83.5
Middle	21	16.2	8	29.6	13	12.6
Lower	11	8.5	7	25.9	4	3.9
White						
All sites	111	100.	20	100.	91	100.
Upper	85	76.6	10	50.0	75	82.4
Middle	17	15.3	5	25.0	12	13.2
Lower	9	8.1	5	25.0	4	4.4
Non-white						
All sites	19	100.	7	100.	12	100.
Upper	13	68.4	2	28.6	11	91.7
Middle	4	21.1	3	42.9	1	8.3
Lower	2	10.5	2	28.6	—	—

TABLE XXXIV

SITE OF LESIONS BY ACTIVITY AND RACE IN COMPARISON GROUP
(Limited to Cases with Involvement of Only One Lung Third)

THIRDS	ALL CASES		ACTIVE		OTHER THAN ACTIVE	
	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution
All races						
All sites	126	100.	8	100.	118	100.
Upper	109	86.5	4	50.0	105	89.0
Middle	13	10.3	1	12.5	12	10.2
Lower	4	3.2	3	37.5	1	0.8
White						
All sites	108	100.	7	100.	101	100.
Upper	95	88.0	4	57.1	91	90.1
Middle	10	9.3	1	14.3	9	8.9
Lower	3	2.8	2	28.6	1	1.0
Non-white						
All sites	18	100.	1	100.	17	100.
Upper	14	77.8	—	—	14	82.4
Middle	3	16.7	—	—	3	17.6
Lower	1	5.6	1	100.0	—	—

TABLE XXXV

DISTRIBUTION OF LESIONS BY INVOLVED SIDE AND ACTIVITY (TUBERCULOUS DIABETICS)

SIDE	ALL CASES		ACTIVE		OTHER THAN ACTIVE	
	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution
Total	260*	100.	79	100.	181	100.
Left only	57	21.9	16	20.3	41	22.7
Right only	112	43.1	26	32.9	86	47.5
Both	91	35.0	37	46.8	54	29.8

* One pericarditis (active) could not be classified as to side of lesion.

TABLE XXXVI

DISTRIBUTION OF LESIONS BY INVOLVED SIDE AND ACTIVITY (COMPARISON GROUP)

SIDE	ALL CASES		ACTIVE		OTHER THAN ACTIVE	
	Number	Per cent distribution	Number	Per cent distribution	Number	Per cent distribution
Total	250	100.	28	100.	222	100.
Left only	52	20.8	3	10.7	49	22.1
Right only	88	35.2	7	25.0	81	36.5
Both	110	44.0	18	64.3	92	41.4

TABLE XXXVII

SITE OF CAVITIES IN TUBERCULOUS DIABETICS

THIRDS	LEFT LUNG	RIGHT LUNG
All sites	17	21
Upper third	8	14
Upper two-thirds	2	2
Middle third	7	4
Lower third	—	1

TABLE XXXVIII

SITE OF CAVITIES IN COMPARISON GROUP

THIRDS	LEFT LUNG	RIGHT LUNG
All sites	4	4
Upper third	3	1
Upper two-thirds	—	2
Middle third	1	—
Lower third	—	1

Date_____, 1946

1. Name _____
2. Home Address _____ 3. Age _____ (at last birthday)
4. Sex____ 5. Race____ 6. Marital Status_____ (Single, Married, Widowed, Divorced)
7. Present Occupation_____ If unemployed, why?_____
8. Present Business Address _____
9. Present Occupation of Spouse _____
10. Wt._____ 11. Ht._____ 12. Ideal Wt._____ 13. % Normal Wt. _____
14. Maximum Wt._____ 15. Date of maximum wt. _____
16. Duration of diabetes: a. Year sugar was found in urine _____
    b. Symptoms first noted _____
17. Does anyone in your immediate family have diabetes?_____ If so, state relationship _____
18. Present insulin units taken: Morning——; Noon____; Evening____; Night_____
    Protamine____; Regular____; Globulin____
19. Have you ever had:
    Boils?_____ How frequently? _____
    Colds or grippe?_____ How frequently? _____
    Gangrene?_____ When? _____
    Amputations?_____ When? _____
20. Do you have high blood pressure?_____ Pains in feet and legs? _____
    Acidosis or coma?_____ How many times? _____
    Diseases other than diabetes? _____
21. Have you ever had tuberculosis?_____ If so, when was it diagnosed? _____
    By whom?_____ When was it arrested? _____
    Chest x-ray ever taken?_____ When?_____ Date last previous x-ray? _____
    Comments _____
22. Have you been in contact with a known case of tuberculosis?_____ If so, state relationship_____ Date and duration of contact? _____
23. Have you ever had pleurisy?_____ If so, when?_____ Dry or wet? _____
24. Name of private physician _____
    Address _____ Tel. Number_____
25. Hospital Clinic _____
    _____ Interviewer

QUESTIONNAIRE I. Information supplied by the patient

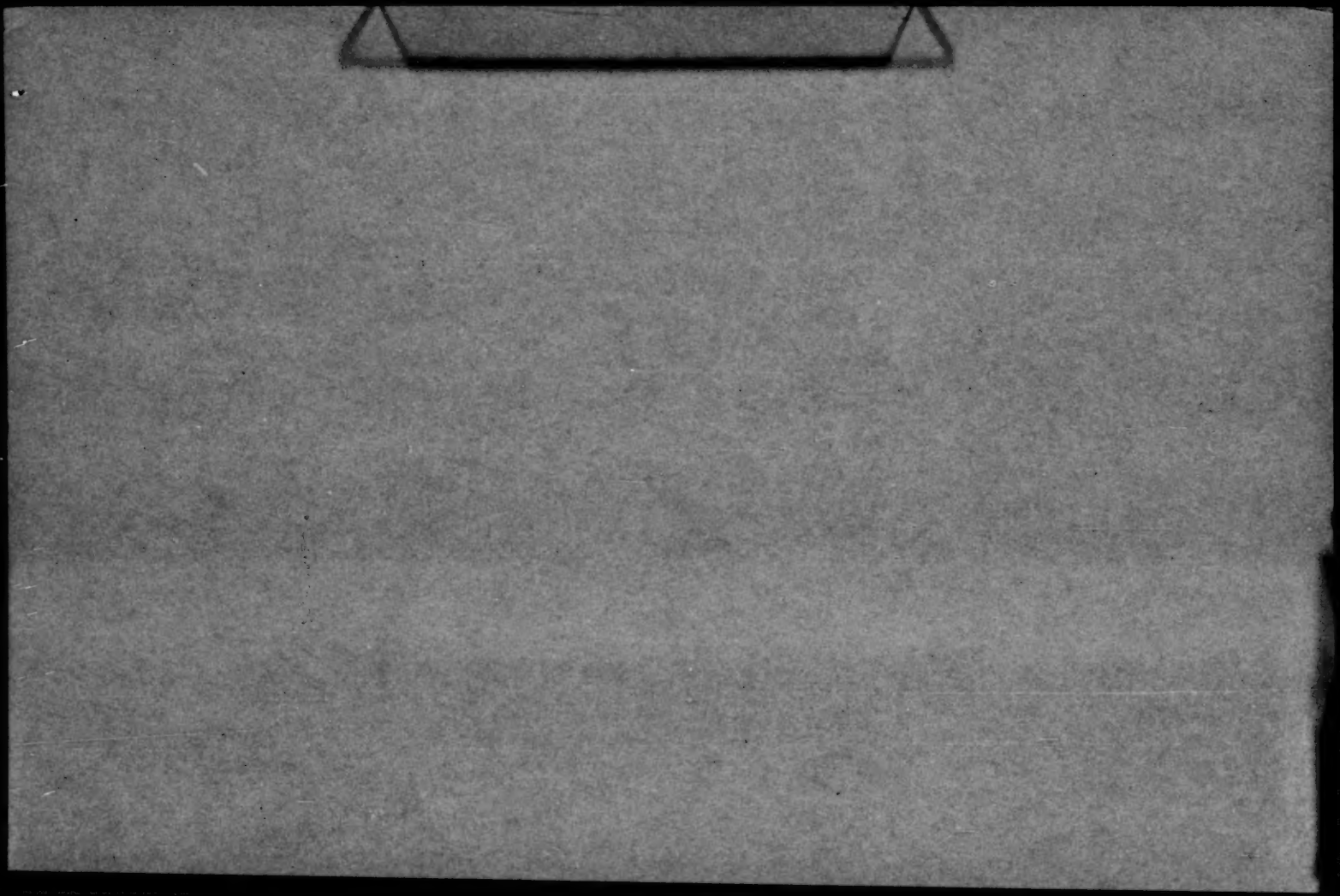
THE PHILADELPHIA TUBERCULOSIS AND HEALTH ASSOCIATION

311 S. Juniper Street

Mr.
Mrs. _____ has diabetes and
Miss
is taking a diet of C_____ P_____ F. _____
Control of diabetes is: Good* _____
Fair _____
Poor _____
The last 5 blood sugars were _____ mg.
_____ mg.
_____ mg.
_____ mg.
_____ mg.
Highest previous blood sugar: Fasting _____
After a meal _____
Sugar in the urine is: Usually present _____
Sometimes present _____
Almost never present _____
The following diseases have also been present:

	Yes	*No*	*Date*
Coma			
Insulin shock			
Hypertension			
Gangrene			
Amputation			
Cataract			
Carbuncle			
Tuberculosis			
Other diseases (specify)			

_____ M.D.

* Good—free of glycosuria and blood sugar within normal limits.
Fair—blood sugar above normal: occasional glycosuria.
Poor—obvious negligence on the part of the patient.

QUESTIONNAIRE II. Information supplied by the physician